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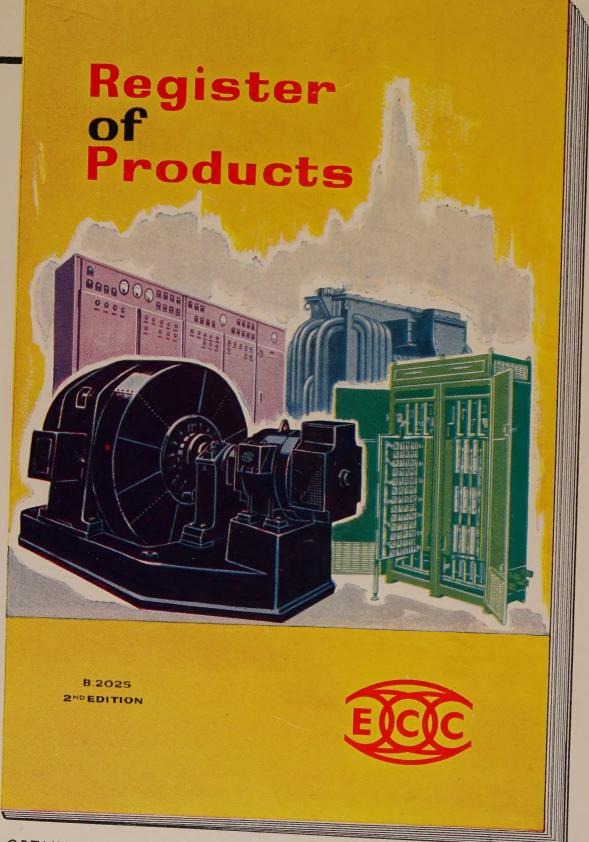




lighting fittings for every purpose

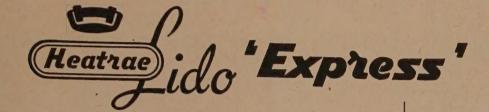
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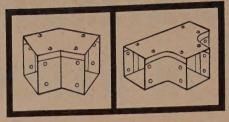
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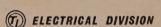
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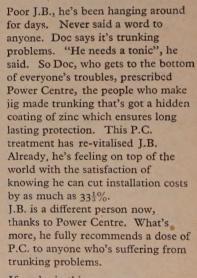
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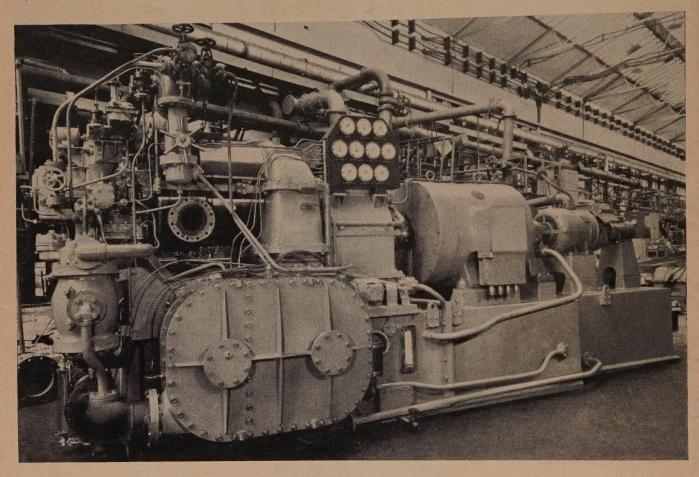
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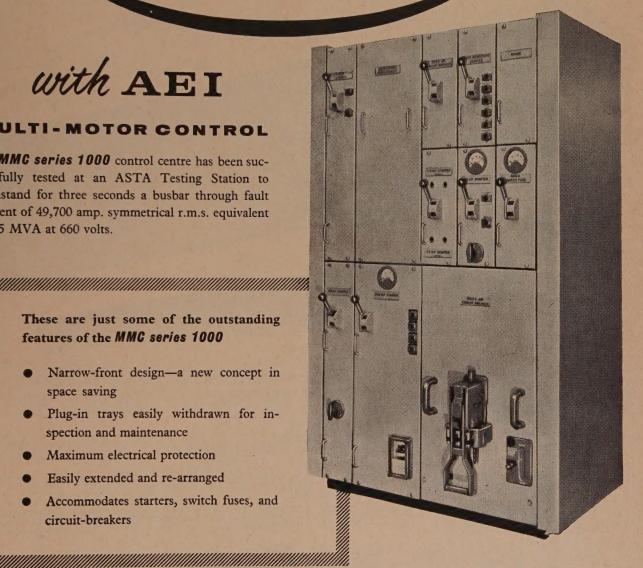
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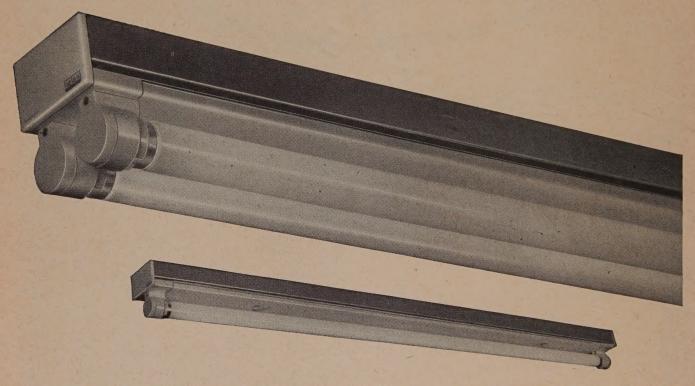
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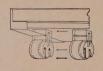
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Atlas Atlantic 2 is a new range of fluorescent lighting fittings with many advantages over all others yet conceived. Using one basic spine, plus a minimum of attachments, a wide variety of fittings can be created to meet the precise lighting needs of almost any industrial, commercial or municipal installation. Appearance is superb, efficiency outstanding, finish immaculate; yet prices show savings of up to 25% on previous designs.

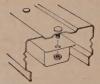


The AAK series of single and twin tube batten fittings illustrated above, is available in 8 ft., 5 ft. and 4 ft. lengths. These general purpose fittings can be used in any location where an unshielded fluorescent tube is acceptable.

Incorporated in the spine are many features which will reduce installation and maintenance costs. These include: new, spring loaded lampholder; starter switches replaceable without dismantling; single component spine, pre-wired; fast, positive fixing of attachments; drip and dust proof, closed back; 'Miracryl' finish; and others illustrated.



Improvedlampholders Welded screw studs need no fixing, no for easy gear replace-



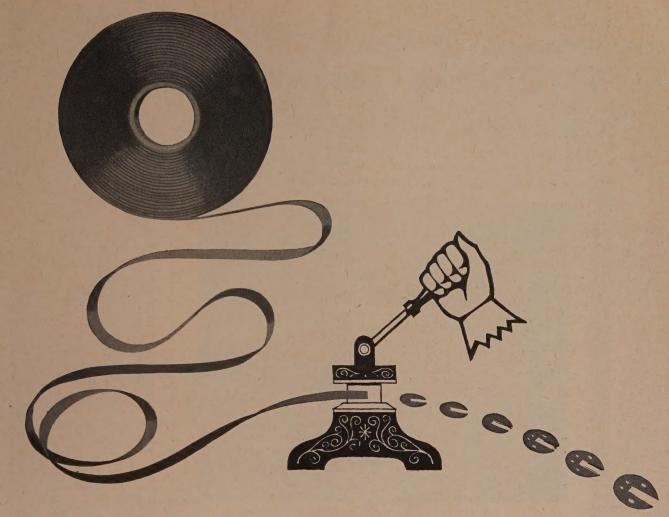


when mounted in con-tinuous runs. Rugged cast end plates.

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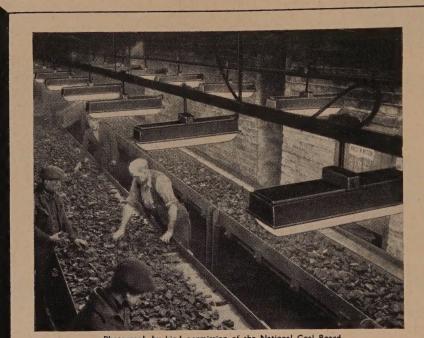
Do you wind it...or stamp it? That depends on the industry you're in, which – in turn – probably depends on Delanco to supply the coil for a variety of important uses. The electronic, radio/television and motor components industries in particular use Delanco coil, made in Fibre, Presspahn, Leatheroid, Elephantide, interleaving paper down to .001" thickness and many composite materials. The thinnest material can be cut to \(\frac{1}{16} \)" and the thickest \(\frac{3}{8} \)". Whatever your uses for coil, Delanco can supply your needs.

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Ships and Radar More ar



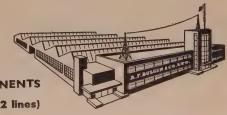
By courtesy of Messrs. Decca Radar Ltd. Southampton Harbour Radar Installations.

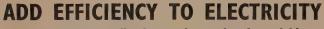
More and more closely connected. When the recently launched 42,000 ton "Oriana" of the P. & O .-Orient Lines (pictured above) left Southampton on her maiden voyage to Sydney, her course through Southampton Harbour would have been tracked by one of the many radar screens installed there by Messrs. Decca Radar Ltd. (lower photograph) to assist with navigation and provide a modern port information service. And once on the high seas this luxury liner's own advanced Dual Radar Installations TM.909 and D.808, of the same manufacture, will ensure the safety of the many passengers throughout the voyage. Here the connection is very close, but there is yet another; electronic and electrical components such as switches, signal lamps, plugs and sockets, etc., were in both ship and radar installations supplied by the House of Bulgin, and in many ways play an important part in the efficient running of both. All components supplied to these companies as well as the many others manufactured by us, are illustrated with full technical details in our Comprehensive Catalogue No. 201/B, obtainable post free to trade letterhead or order. This is supplemented by our News Bulletin, published at regular intervals, giving detailed information regarding new components we manufacture, circulated free to all who ask for it.

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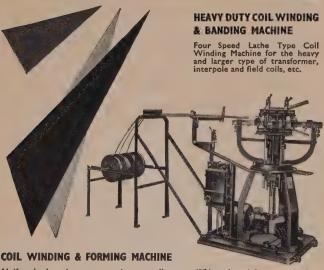
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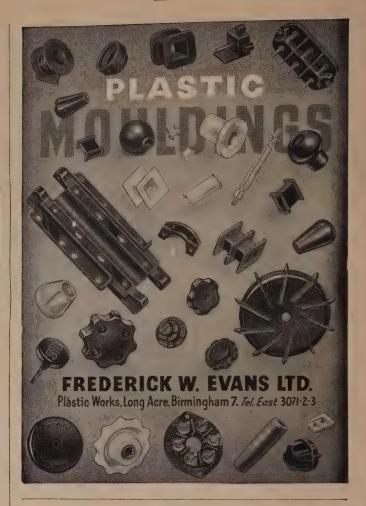
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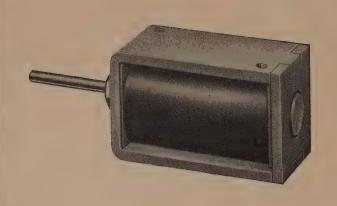


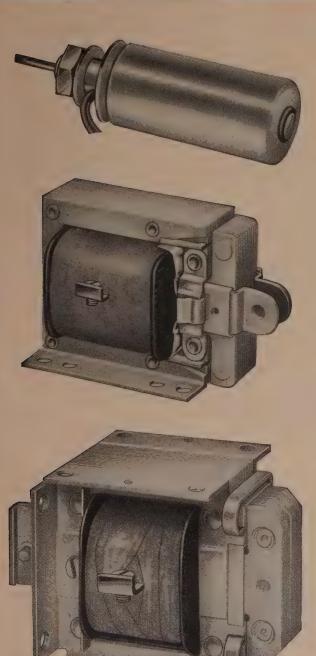
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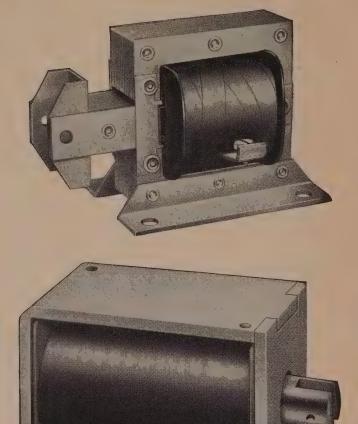
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1912-1961

THE STORY OF

BELLING & COMPANY LIMITED

No. 39 APRIL 1961

Yearly Report of the Governing Director to all Employees and also to our many customers and friends in the Electrical Trade

This year my Annual Report is written from home instead of on the high seas, and I am glad to say that business during the past year has gone reasonably well. Our sales have reached 23% above those of the previous year and we almost reached our target figure of 25%. Everyone is to be complimented on this splendid result and the efforts necessary for its achievement.

One item which perhaps is not quite so good is that our margin of profit on sales has again fallen a little, mainly due to an increase in wages which came into operation on 1st January, 1961. This latter we have, so far, absorbed ourselves by being satisfied with a reduced profit rather than increasing the price of our goods which might seriously affect our sales in the home market and reduce our chances in the export field. Whether we have done the right thing only the future will show, but increased sales may enable us to improve our profit margin and, under our method of Finance, help us to plough back more money into the business and thus maintain our normal expansion programme. This business, as you all know, has built itself up entirely out of its own profits and, fortunately, owes nothing to anyone. This is the result of the combined efforts of everyone here and at Burnley together with the goodwill of all our customers.

However, we have sufficient profit still left to once again pay out a share to all employees on a similar basis to last year, i.e. the same figure "per point". This will total somewhere around £180,000 for the year, making our total distribution over the last thirteen years to well over the £1,000,000 mark.

Other practical matters in connection with 1960/61 are: **Employment:** Now above 3,000 at the two Works and on full time all the year.

Enfield Extensions: The 60,000 sq. ft. started early in 1960 is practically complete and nearly all in use. The top floor, which has a fine view over the district, is our new Canteen, and this will easily be able to deal with 1,000 employees daily.

We have also commenced the new three-storey frontage to our East Building comprising another 16,000 sq. ft., and we expect to commence the new three-storey frontage to our West Building during this summer, when another 24,000 sq. ft. will then be available to us—and that's the lot for which permission can be obtained.

Our building programme at Enfield—when completed—will give us 506,000 sq. ft. of production area. Total site area—10 acres.

Burnley Extensions: The weather has held us up here considerably but we are now fairly advanced with the levelling and foundations of our third 144,000 sq. ft. building, although it looks like being October before it will be of any real value to us. When completed, this will make three buildings of over 100,000 sq. ft. which we have built ourselves plus a separate 100,000 sq. ft. factory we purchased last year. These main buildings, together with other small additions, give us 520,000 sq. ft. with still another 16-acres on which to build. Total site area—37 acres.

Scottish Storage Centre: Levelling, drainage and foundations are being planned. Total site area—8 acres.

Midland Storage Centre: Preliminary building work is being examined and we hope to commence actual construction this year. Total site area—15 acres.

The total area of our freehold land is now some 70 acres, with a total production area at Enfield and Burnley of some 1,025,000 sq. ft. when all present building work is complete.

Fire Production: We have again had a splendid season and our Burnley Works are to be complimented on their increased production which was right up to the space available.

Cooker Production: Enfield have also done extraordinarily well, irrespective of being badly handicapped for space and also by the building and moving operations which have been going on. Our 47AB, 48, "Classic" 60 and Horizontal Classic 70 are all doing well and getting into real streamlined production. Our old 47AB (now 14 years on the market) still has the biggest sale—very reliable, very simple, no gimmicks, and very little "servicing" needed. "My mother still has one of your 47's", we often hear.

Development and Research: This department is now settling down after alterations and the "Corinthian" Fire is their latest contribution. We have several new developments going forward and these will get into our catalogue in due course.

Export: Here we are faced with increasing difficulties due mainly to the uncertain political and economic climate in many of our overseas markets. Nevertheless, we continue to enjoy a substantial share of such business as is available to us and, of course, are constantly on the look-out for fresh opportunities.

Advertising: We try to make this reasonably interesting although it is really quite a puzzle to know in which papers to advertise and exactly what to say. However, as a result of our national and local advertising we have had more requests for our large catalogue than ever before and so, on the whole, it must have been fairly successful.

Catalogues: Our 1961/62 catalogue will be very nearly the same as the 1960/61 edition but with a specially distinctive cover. We hope to be able to maintain our prices unchanged although we very much doubt our ability to do so.

Prospects for 1961/62: We think these will be good if there are no major troubles, so we are once again setting our target at another 25% increase in production and sales, and we further hope by increased efficiency to be able to improve our margin of profit. To reach both these targets we shall want everybody's help—builders, producers, sales and customers, and to get this help we know quite well we shall really have to earn it.

Remember, next year is our 50th anniversary, when we shall have something very special to tell you.

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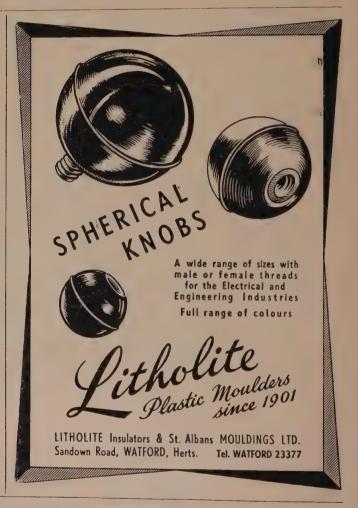
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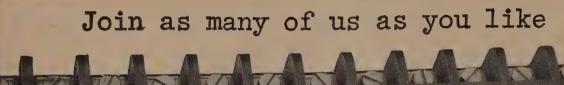
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formerly Colne Switchgear (K. & W.) Ltd. Walton Street, Colne, Lancs. Telephone: Colne 1394|5



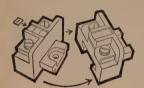








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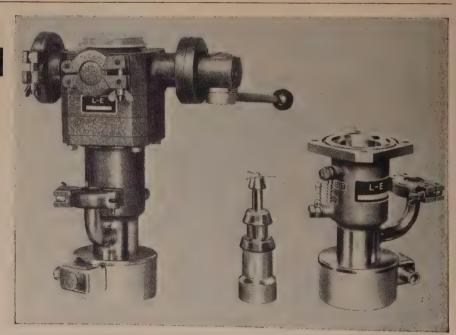
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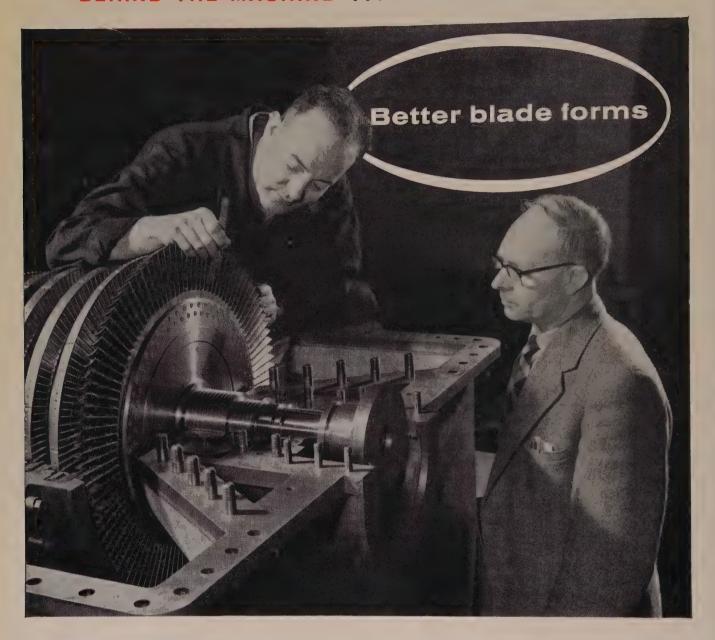
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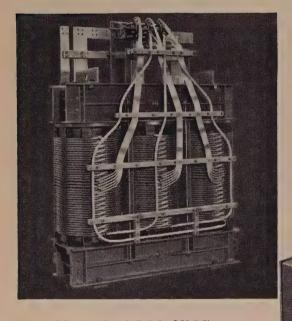
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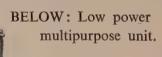
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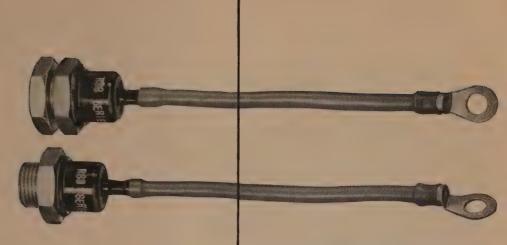


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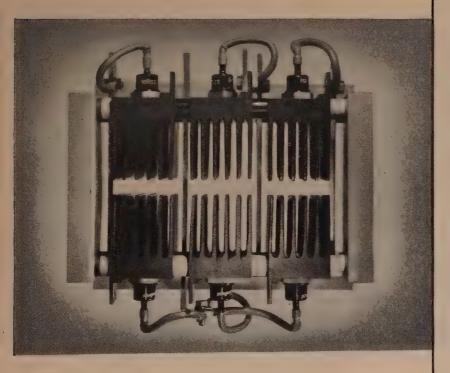
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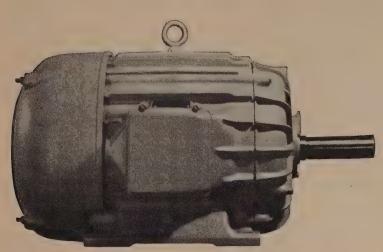
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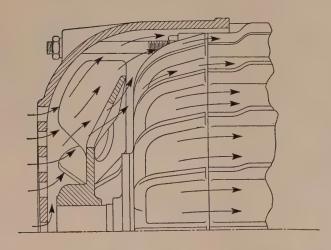
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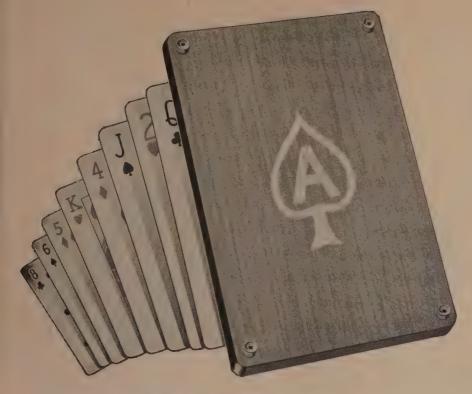
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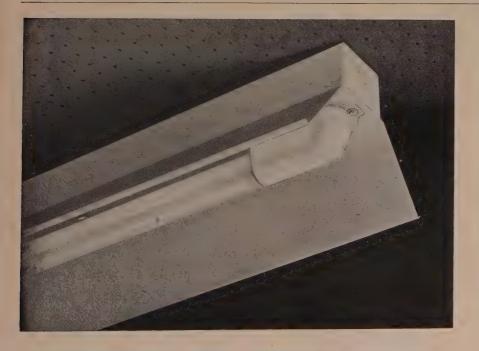
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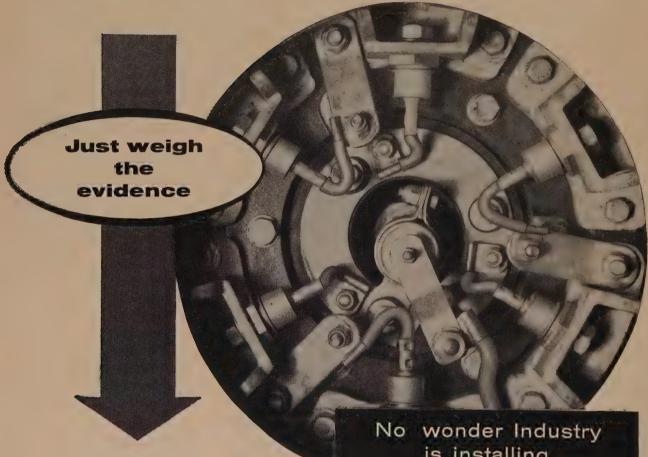
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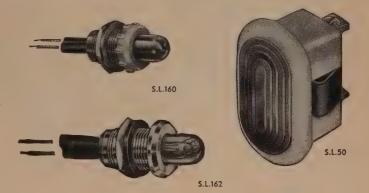
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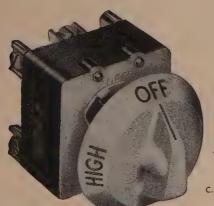




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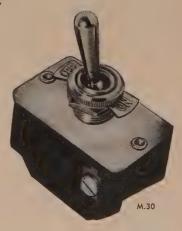
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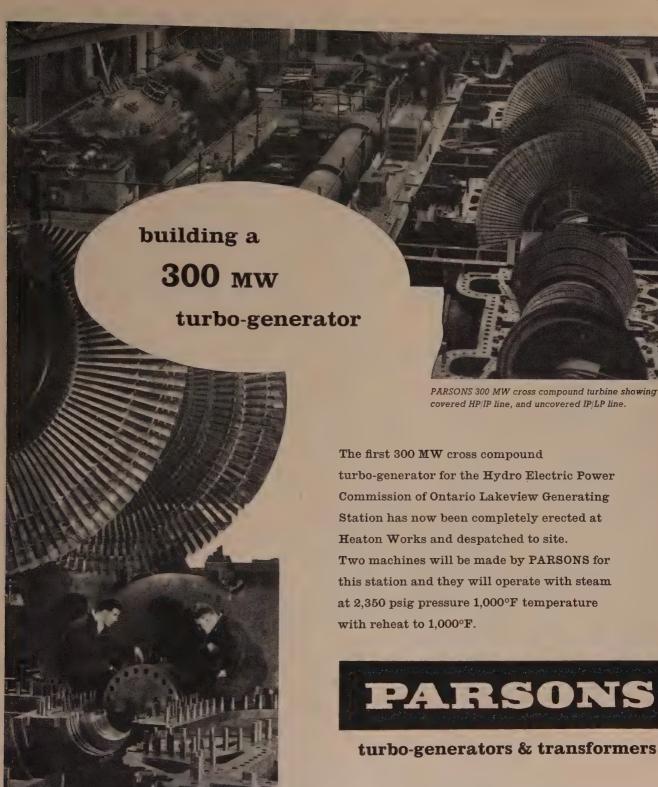
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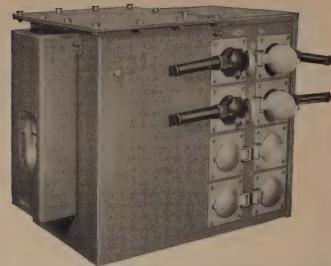
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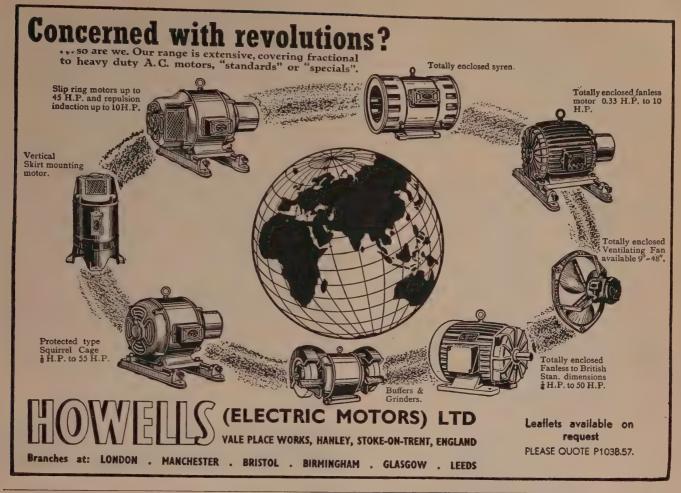
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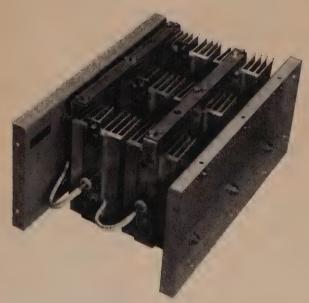
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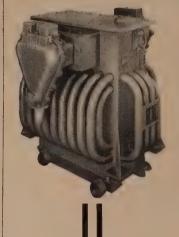


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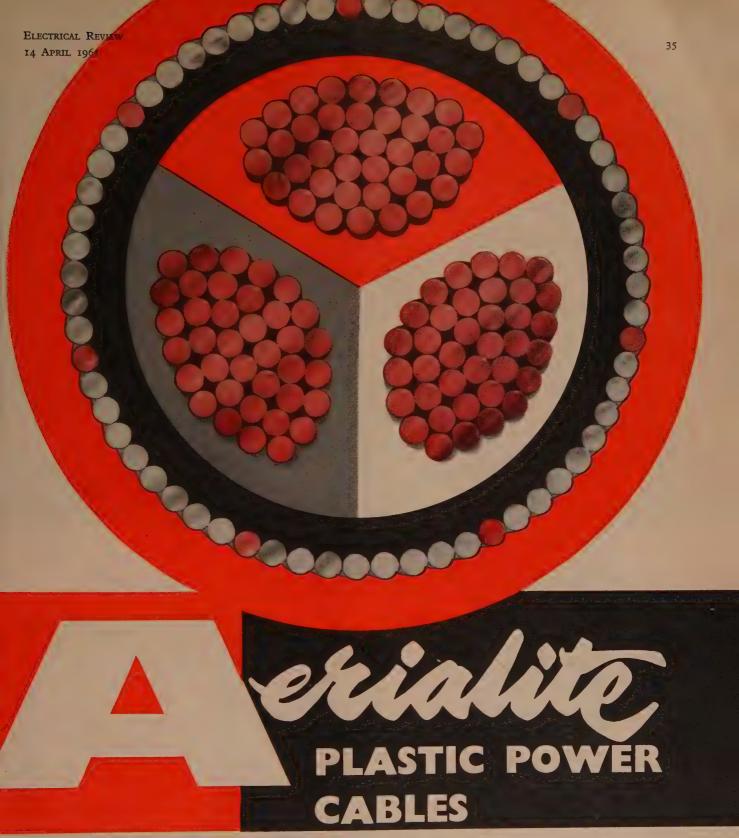
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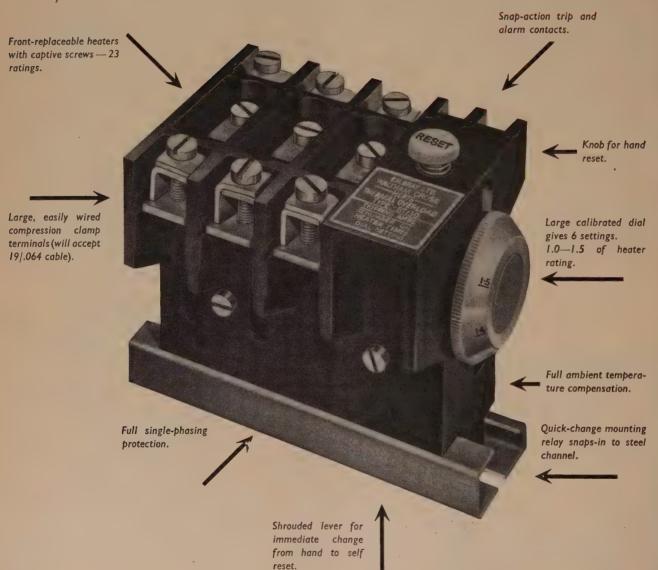
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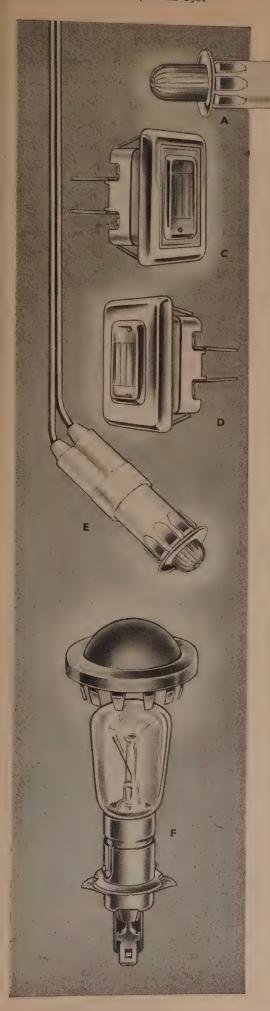


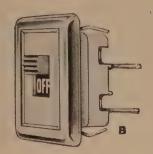


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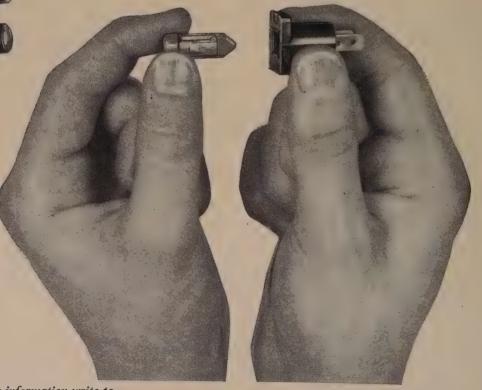
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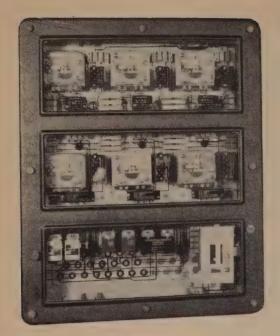
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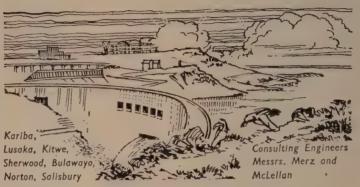
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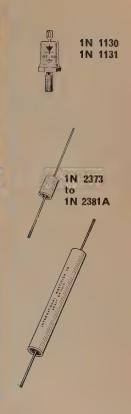
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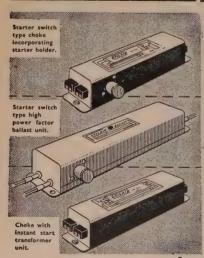
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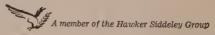
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ELECTRICAL REVIEW

Friday 14 April 1961 Volume 168 No 15

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Associated Television's new Elstree studio centre was officially opened last week by Dr. Charles Hill. When completed it will have a total studio floor area of 32,000 sq ft

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ELECTRICAL REVIEW

14 April 1961 Vol. 168 No. 15 Established 1872

Towards Better Lighting

T was not until 1936 that values of illumination for different situations and occupations were assessed on a scientific basis with the publication of "Recommended Values of Illumination" by the Illuminating Engineering Society. The Society intended it to be a guide to good interior lighting in buildings. The basis of the recommendations, mainly due to H. C. Weston, was related to the speed and accuracy with which the detail of individual visual tasks could be perceived. Account was also taken of the cost of good lighting and the recommended values were made economically realistic.

These recommendations were related purely to illumination levels; various factors giving rise to eye-strain, such as direct and reflected glare, were not considered. In the fifth edition of the "I.E.S. Code for Lighting in Buildings," now issued, recommendations for limiting glare have been made for the first time. The approach to this complete revision of the Code has been to emphasise the quality of light in relation to brightness to produce an efficient and comfortable installation. The new Code has also raised the standard levels of illumination by various amounts, the average being about 50 per cent. This has been necessitated by the demand for maximum productivity, the highest standard of safety and other factors such as welfare and amenity.

The increased illumination levels now recommended naturally increase the risk of glare although the two are not necessarily tied together very closely. It had been realised for many years that some practical system of glare limitation would be of great advantage to designers, but although a mass of well-substantiated data was available, the difficulty has been to reduce this information to a form which could be easily interpreted by the practising engineer. In the new Code, this has been done by establishing

limiting values for the glare index for different situations.

The amount of glare which can be tolerated without discomfort varies with occupation. For example, a watchmaker will be more sensitive to the effect of a given amount of glare than a man in an iron and steel works who may be quite unaware of the presence of glare from lighting fittings. The values for limiting glare given in the Code for different occupations are the result of more than one hundred surveys made by experienced observers, combined with the great volume of data already available at the Building Research Station.

Having obtained the recommended value for limiting glare, the engineer

then has to calculate the actual glare produced by his proposed installation. The availability of modern computer techniques has enabled the fundamental data already established to be reduced to a set of tables from which the glare from general lighting installations can be calculated in a few minutes.

One of the important consequences of the new recommendations may be that not only will the design of lighting installations be affected, but new designs of lighting fittings will be required. Although this will be mainly due to the effect of the limiting glare index, the Code now also recognises the impossibility of providing sufficient daylight in many modern buildings and gives recommendations concerning the proper design of permanent artificial lighting or "daylighting." Thus, the new Code appears to be a firm basis for realistic modern lighting design.

NUCLEAR POWER POSITION

Because the need for supplementing conventional power resources by atomic energy is not so urgent there, the United States is proceeding on different lines from us in the nuclear field. The aim is said to be the production of economic power by 1968: economic meaning competitive with existing methods of power production. This has meant experimentation with a much larger variety of reactors than in this country.

A Congress committee was recently told by Mr. Philip Sporn, of the American Electric Power Co., that he considered that the United States had an excellent record in this respect. According to an Electrical World report, Mr. Sporn said: "If it doesn't add up to kilowatt-years, it adds up to the impressive list of reactor projects that has produced an amazing amount of engineering knowledge." He further claimed that the United States was doing better than any other This, of course, depends on the way one regards it. Here we are soon starting up two nuclear power stations of over 300 MW and a further six are under way—with capacities of up to 600 MW. The earlier stations may not be "economic" in the sense referred to above, but they will make a substantial contribution to the nation's power supply.

MARINE INSTALLATIONS

The services provided by the electrical installation in a ship and the way in which they are supplied vary considerably with the type of vessel and the duties which it has to perform. Two of the new ships recently placed in service which are of comparable size, the 22,000 ton H.M.S. Hermes and the 27,300 ton s.s. Empress of Canada, are interesting in that they represent almost extreme operating requirements. The former is the latest R.N. aircraft carrier while the second is a new Canadian Pacific passenger liner, details of which are given on page 673 of this issue.

The most noticeable difference is the use of an a.c. system in the R.N. vessel, the other employing d.c. There are now many R.N. ships in service with

a.c. installations and it is Admiralty policy for all new ships of the frigate class and above to be so equipped. This is not generally so with merchant vessels, although the largest British post-war liner, the Canberra, will employ a.c. for the general services in addition to the propulsion machinery. Both Hermes and Canberra have 60 c/s systems.

The installed generating capacity in Hermes is nearly 6 MW but this includes an "adequate reserve," power under normal seagoing conditions being supplied by two 1,000 kW turbo-generators. In the Empress of Canada there is over 4.5 MW of installed capacity. A major variation occurs, however, in the plant layout. In the warship it is distributed in the forward and after parts, with a complex system of interconnections to ensure supply continuity should action damage occur. The principal consideration in the liner is the provision of maximum accommodation space and the machinery is therefore concentrated in a few compartments amidships, from which ring main circuits are taken to the forward and after ends and the machinery space.

GROWTH AND COMPETITION

Contradictions in Government economic policy as it affects the domestic appliance side of the electrical industry are not resolved in the *Economic Survey* 1961 published last week. The Government recognises the need for growth of the economy, but it does not believe that "a greater pressure of demand than at present would in fact increase a sustainable rate of growth." Production can be allowed to expand only if exports rise even faster. The over-riding need is still to obtain an adequate improvement in the balance of payments.

Much emphasis is placed on making British industry more competitive. "Growth and competitiveness can never be separated." But whereas it is possible to agree that the Government has been generally successful in its aim " to restrain the growth of demand without checking the incentive to invest," the impact of its measures on individual industries cannot be ignored, especially where these are amongst the most pro-Domestic appliance manufacturers fulfil most of the Government's criteria for greater industrial efficiency; they have been giving increasing value for money and are now tackling exports energetically. the damping down of demand ("household durables" was the only item of consumer spending that actually fell last year) has inevitably led to rising unit costs in a section of industry in which modern production techniques are widely used. Manufacturers' ability to compete abroad is consequently impaired.

It is unlikely that next week's Budget will provide any direct stimulation of home consumption but it is reasonable to conclude from the *Economic Survey* that the Government is now less ready to apply the brake suddenly so long as exports are expanding. It may, however, try to encourage exports by making the home market more competitive.

The article explains the need for impulse voltage testing and describes the basic principles of operation and the construction of high-voltage impulse generators. Methods of tripping and of voltage measurement are reviewed, and a new multi-stage impulse generator circuit, which overcomes certain disadvantages of conventional circuits, is described

High-Voltage Impulse Generators

By T. E. BROADBENT, M.Sc., Ph.D., A.M.I.E.E.*

WHEN lightning strikes a transmission line the voltage thus produced is in the form of an impulse (or "surge"), the peak value of which may be many times the normal operating voltage of the line. If failure of transmission equipment in service is to be avoided it is clearly necessary that it should be satisfactorily tested under surge conditions before leaving the factory. Considerable attention is therefore paid at the present time to the insulation testing of electrical transmission equipment at high voltages, especially those components which are connected directly to the overhead lines.

In the early days of insulation testing it was considered sufficient to use a power-frequency testing voltage for this purpose, but since the insulating properties of an electrical apparatus depend not only upon the magnitude but also upon the waveshape of the applied voltage, such tests do not give a true indication of the insulation characteristics which would be obtained in service under lightning conditions. The approximate waveshape of surge voltages produced on a transmission line by lightning is known from practical observations. Thus, a similar waveshape reproduced in the laboratory provides a more realistic test than a power-frequency alternating voltage.

These considerations have led to the development of the high-voltage impulse generator¹ for testing electrical equipment under conditions which simulate those likely to be encountered in service. It has been specified² that the voltage impulse used to test a particular apparatus shall comply with standard stated values of waveshape within certain defined limits. Apart from their use in testing high-voltage equipment, impulse generators are also extensively used in laboratory research work.

Impulse Waveform

A typical waveform of the type used in impulse testing is shown in Fig. 1. The surge waveform obeys the relationship—

 $V = V_0(e^{-at} - e^{-bt}),$

where V = voltage after time t, and V_0 , a and b are constants.

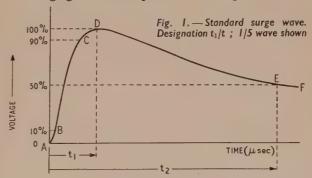
The portion ABCD is termed the "wavefront" of the surge and DEF the "wavetail." The shape of the surge is denoted by numbers: e.g. a t_1/t_2 surge is one in which the time for the voltage to reach its peak value (measured from A) is t_1 and the time in which the voltage falls to half its maximum value (again measured from A) is t_2 , where both t_1 and t_2 are in microseconds. In this country the standard specified testing waveshapes are 1/5 and 1/50. Since it is difficult to determine exactly the

points at which the start and crest of a surge wave occur, the British Standard defines the nominal wavefront t_1 as being equal to 1.25 times the time interval between points B and C, corresponding to 10 per cent and 90 per cent of the peak impulse voltage.

Single-stage Impulse Generators

In considering the principle of operation of impulse generators, a spark gap is assumed to act as a high-voltage switch. This assumption is justified to a first approximation since, when a spark gap breaks down, the voltage difference between the electrodes is small. A single-stage impulse generator is one in which, using a single capacitor, an impulse voltage can be produced from a direct voltage charging supply. There are two alternative methods by which this can be done, the two circuits being given in Fig. 2.

A circuit is shown in Fig. 2 (a) in which both electrodes are brought to earth potential when the spark gap breaks down. With this system a direct voltage is applied to A, thus charging the main capacitor C_T through R_T. When



the spark gap G breaks down, the point A is brought suddenly to earth potential and a voltage pulse is produced at B equal in magnitude to the charging voltage and opposite in sign. Waveshaping is accomplished by means of four circuit components; the time constant R_TC_T controls the length of the wavetail and R_FC_T the duration of the wavefront. The output surge voltage is produced at C.

In the circuit shown in Fig. 2 (b) both electrodes of the spark gap are brought to a high potential when the gap sparks over. The direct charging voltage is applied to A, one end of the main capacitor C_T being earthed. When conditions are steady, breakdown of the gap G will cause the point B to be raised to a potential equal to that

^{*} Electrical Engineering Department, Manchester University.

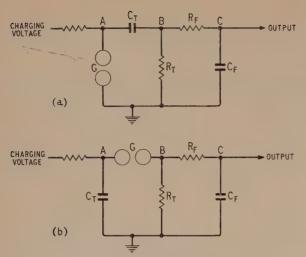


Fig. 2.—Single-stage impulse generator circuits

of the charging supply. With this method the impulse voltage produced is therefore of the same polarity as the charging voltage. The waveshape of the output voltage produced at C is again governed by the constants R_T , R_F , C_T and C_F .

In each of these systems the circuit constants are so arranged that an output waveform of standard waveshape is produced. In order to avoid a serious loss in output voltage due to voltage division between $C_{\rm T}$ and the test load, the capacitor $C_{\rm T}$ should have a capacitance several times greater than that of the load to be tested.

Although the voltage produced at B in each circuit at the instant at which the spark gap breaks down is almost equal to the direct charging voltage, the peak output voltage at C is less than this value, due to the effect of the waveshaping circuit. The efficiency of the impulse generator and waveshaping circuit is therefore defined as follows:—

$$Efficiency = \left(\frac{Peak\ Output\ Voltage}{Direct\ Charging\ Voltage}\right) \times 100$$

The single-stage impulse generator described in this section is an excellent means of producing surge testing voltages provided that a charging supply of sufficiently high potential is available. The system has the desirable feature of simplicity and an existing d.c. generator may easily be arranged to produce impulses in this manner. In most high-voltage laboratories, however, the direct voltage available is limited, so that other means must be used in order to produce very high impulse voltages. The usual method by which this is achieved is to use the multi-stage impulse generator.

Multi-stage Impulse Generators

The multi-stage impulse generator is an arrangement in which several capacitors may be charged in parallel and then discharged simultaneously in series, the output voltage thus being equal to the charging voltage multiplied by the number of stages. A typical multi-stage impulse generator and waveshaping circuit is shown in Fig. 3 (a). When a charging voltage is applied to the point A_1 , the capacitors C charge in parallel through the high resistors R. The time constants RC are usually such that the charging process may take several seconds. If the charging voltage is, say, +100 kV, the points A_1 , A_2 ... A_n will be at

a potential of +100 kV, and the points B_1 , B_2 . . . B_n at earth potential. Each spark gap must be set to a length just too great to allow breakdown to occur due to the direct charging voltage. It is clear that if, by means of a trigger mechanism, the gap G1 is made to break down, a voltage pulse of -100 kV will be produced at B1, the principle of operation being the same as that of the circuit shown in Fig. 2 (a). Assuming that A₂ remains at constant potential when G1 fires, the voltage across G2 will therefore increase from 100 kV to 200 kV, thus causing this gap also to break down. In a similar manner the remaining gaps G3...Gn spark over in rapid succession and an output voltage of -100n kV is produced at B_n. The output capacitance of the impulse generator is equal to the stage capacitance divided by the number of stages. The surge voltage output is taken from the point C.

In practice the voltage distribution across the various spark gaps is rather more complicated than that described in the elementary treatment given above. This is because the assumption that A2 remains at constant potential when G₁ fires is not valid. In fact, the potential of A₂ when G₁ fires is fixed solely by the various stray capacitances of the circuit. Thus, if the stray capacitance from A2 to earth is large compared with the self-capacitance of G₂, the potential across G_2 approaches 200 kV when G_1 fires. On the other hand, if the stray capacitance from A2 to earth is small compared with the self-capacitance of G₂, the voltage across G2 increases by only a few per cent when breakdown of G₁ occurs. Similarly, the overvoltage appearing across each of the gaps $G_3 \ldots G_n$ in turn depends on the stray capacitances of the various stages. Thus, if the stray capacitances are such that the available overvoltage on each spark gap in turn is small the spark gaps in each stage must be fairly critically set if satisfactory operation is to occur.

An important point in connection with multi-stage impulse generators having circuits such as those of Fig. 3 is that, for efficient operation, the spark gaps G_1 , G_2 , G_3 ... G_n must be in line and be able to "see" each other (i.e., not screened by any opaque material), otherwise there may be an appreciable time delay between the successive breakdown of these gaps. If this were so, the wavefront of the output impulse voltage would be stepped in nature. The reason why the gaps must be in line is that ultra-violet radiation produced by the breakdown of the gap G_1 then ionises the spark path in each of the other gaps, thereby facilitating the passage of the spark in each gap and increasing the likelihood of a short time lag to breakdown.

In Fig. 3 (a) the waveshaping components R_T, R_F and C_F are shown to be situated away from the impulse generator circuit. This arrangement of the circuit components is known as the "lumped" system. An alternative system, shown in Fig. 3 (b), is termed the "distributed" type of circuit. The chief advantage of the distributed system is that its use enables a considerable saving in space to be achieved. Comparison of Figs. 3 (a) and 3 (b) shows that, using the latter method, the components R_T and R_F (each of which may be several feet in length) are removed from the test area into the impulse generator itself. In high-voltage laboratories space considerations are nearly always extremely important and may well be a deciding factor as to which method is to be used. A further important advantage of the distributed system of resistors is that

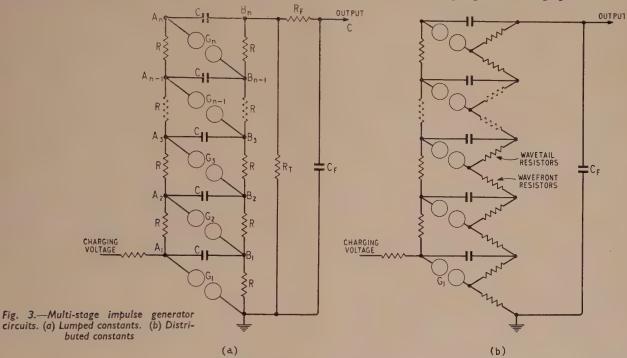
in the event of flashover occurring from one stage of the impulse generator to a wall of the building a certain amount of current-limiting resistance is in circuit, thus reducing the intensity of the spark. In the case of the lumped system of resistors a breakdown of this nature would give rise to an extremely high current in the spark, possibly resulting in damage to equipment.

A disadvantage of the distributed system is that the procedure involved in changing the connections for output voltages of different waveshape (e.g. in changing from I/5 to I/50 surge waves) is a somewhat lengthy one, since the entire set of wavefront and wavetail resistors must be replaced by others. In the lumped system only the two resistors R_T and R_F need be altered. Another disadvantage of using distributed wavefront resistance is that, with all the wavefront resistance within the generator, the external leads, the load, and the external stray capacitance form an oscillatory circuit which needs to be damped by an

is the first gap to break down, the setting of this gap should be made slightly less than that of the other gaps. The alternative system, known as "controlled" tripping, is to keep the gap lengths constant and to initiate breakdown of the impulse generator by means of some triggering circuit. This method has the advantage that the impulse generator can be triggered off at will at any required instant.

A further aspect in the desirability of controlled tripping is that, in impulse tests, it is sometimes necessary to pre-stress the apparatus under test with its normal alternating voltage and to apply a test impulse when the voltage wave is at its peak value. The impulse generator must therefore be tripped at this precise instant and for tests of this type controlled tripping is essential.

In order to determine the waveshape of the output surge from the impulse generator this transient is usually recorded (by the use of a suitable potential divider) on the screen of a high-speed oscillograph. Since the



external resistor. For this reason at least some of the wavefront resistance is normally arranged outside the generator.¹

The efficiency of a multi-stage impulse generator and its associated waveshaping circuit is given by the expression

Efficiency=
$$\left(\frac{\text{Output Voltage}}{\text{Charging Voltage} \times \text{Number of Stages}}\right) \times \text{100}$$

Tripping Circuits

The process by which the spark gaps in an impulse generator are fired (i.e. made to break down), so producing an output voltage, is known as the "tripping" of the impulse generator. An impulse generator may be tripped (or "triggered") in two ways. The first method, known as "uncontrolled" or "self" tripping, is to reduce the impulse generator spark gap lengths together until the first gap (G_1 in Figs. 3 (a) and 3 (b)) breaks down, resulting in the consequent almost instantaneous breakdown of the other gaps. In order to ensure with this method that G_1

electrical transients recorded in high-voltage engineering are invariably of short duration (usually of the order of a few microseconds) some care must be taken in ensuring synchronisation of the waveform to be recorded with the time base of the oscillograph. The tripping and synchronisation procedure which is extensively used at the present time is to remove the two-electrode spark gap from the first stage of the impulse generator and to replace it by a multi-electrode triggered spark gap. A voltage pulse from the oscillograph is then used to trigger off a pulse generator having an output of several kilovolts, which in turn gives rise to a disturbance in the existing conditions of the spark gap and causes breakdown. Several types of multi-electrode spark gap are in use for this purpose at the present time,4 each of which can be made to break down at voltages less than its direct breakdown potential on the application of a trigger pulse.

Fig. 4 (a) shows an impulse generator tripped by a three-ball spark gap. The two gap lengths g_1 and g_2 are equal and the central tripping sphere is maintained at half the charging potential before the tripping pulse is

applied. A tripping pulse of either polarity may be used. Fig. 4 (b) shows a circuit tripped by a system working on a different principle. A hole is drilled in the centre of the sparking surface of a hemispherical electrode E_1 and a rod electrode E_2 is arranged as shown to form an annular gap g_2 in the sparking surface. The main gap g_1 can then be made to break down at voltages considerably less than its direct breakdown voltage by the application of a voltage pulse of a few kilovolts to the central trigger electrode. This device is known as a trigatron⁵ and using this system the main gap g_1 may be made to spark over at voltages as low as half its direct or impulse breakdown voltage by applying a trigger pulse of about 10 kV peak value to E_2 . The breakdown mechanism of the trigatron spark gap has been discussed elsewhere.^{6, 7}

The tripping system shown in Fig. 4 (c) is one method by which the million-volt single-stage impulse generator is triggered in the Electrical Engineering Department of Manchester University. The main gap g₁ is set to a length just too great to allow breakdown due to the charging voltage alone. Breakdown in this gap is then initiated by applying a voltage pulse (of the same polarity as the charging voltage) to the point A. The potential at B thus rises by the same amount and the direct breakdown voltage of g₁ is exceeded. Breakdown occurs and an impulse voltage is produced at C equal in magnitude to the sum of the charging and tripping voltages and of the same polarity. The required surge waveform is obtained using an external waveshaping circuit as shown in Fig. 2 (b).

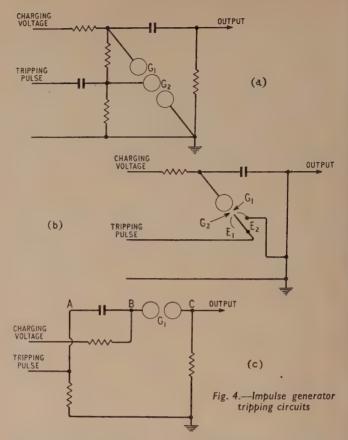
When considering the various forms of triggered spark gap used in impulse generator tripping it is often convenient to quote the "working range" of the gap for a given gap length and trigger pulse voltages, as follows:—

Working Range
$$= \left(rac{V_{D\,C} - V_{min}}{V_{D\,C}}
ight) imes$$
 100 per cent

where $V_{\rm D\,C}$ is the direct breakdown voltage of the gap and $V_{\rm min}$ is the minimum voltage at which the gap will break down each time a trigger pulse is applied. If occasional spurious breakdown, due to the presence of dust particles in the gap, is to be avoided it is desirable to use a spark gap having a working range of not less than about 10 to 15 per cent.

Construction of Impulse Generators

The construction of multi-stage impulse generators is governed mainly by the type of capacitors used. Small impulse generators intended for laboratory experiments and demonstration purposes may be built from any available capacitors of suitable rating, and consequently such generators exist in a variety of different constructions. Large multi-stage generators for testing transmission equipment are usually constructed from specially-made oil-impregnated capacitors in insulating cylinders of porcelain, varnished paper or other suitable material, with metal end-plates. Successive stages of capacitors may be built into vertical columns, each stage being separated from the previous one by empty insulating housings of similar form to those containing the dielectric. Impulse generator spark gaps are normally mounted on two vertical columns, one of which is fixed whilst the other may be rotated, thus altering the spacings of the spark gaps. The number of stages in a multi-stage



generator depends mainly on the charging voltage available and the output voltage required but is usually between 10 and 20, with a capacitance per stage of about 0·1 μ F to 0·36 μ F. Arrangements are generally made whereby stages may be paralleled if required, so as to produce a smaller output voltage with increased output capacitance. Modern multi-stage generators have been built which produce voltages approaching 5 MV.

New Circuit

It has already been stated that when the first stage of a multi-stage impulse generator breaks down, the voltage appearing across the second-stage spark gap is governed by the stray capacitance of the various parts of the equipment. Similarly, the voltages appearing across the third and subsequent gaps are also fixed by stray capacitance. In practice, the available overvoltage across the successive gaps is small, and the circuit consequently suffers from the following disadvantages:—

(a) The gaps G_1 , G_2 ... G_n must be arranged exactly in line, so that ultra-violet light from the first gap G_1 irradiates all the other gaps.

(b) The spacing (i.e. the distance between the electrodes) of the gaps $G_2 \ldots G_n$ must be only slightly greater than the spacing of G_1 , otherwise $G_2 \ldots G_n$ do not break down when G_1 breaks down.

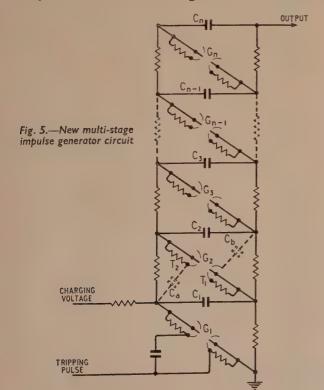
(c) For given spark gap spacings $G_1 cdots G_n$ the impulse generator operates over a very limited voltage range.

(d) Since the spark gaps must be critically set spurious breakdown may occur in the spark gaps, causing an unwanted impulse voltage to be produced at the output terminal of the generator.

It is well known that a trigatron spark gap (when

triggered) will break down at a voltage considerably less than that of a two-sphere spark gap of similar dimensions. 5-7 In view of this fact a new impulse generator circuit has recently been devised,8 in which the impulse generator sphere gaps (Fig. 3) are replaced by trigatron spark gaps. The new circuit is shown in Fig. 5. Thus, each spark gap is replaced by a triggered spark gap, which will operate over a much greater voltage range with given gap spacings. Each trigatron is triggered by the breakdown of the preceding stage. The attractive feature of this circuit is that for all impulse generators other than very small ones no coupling capacitors are required between the trigatrons and the spark gap of the preceding stage; the stray capacitance between stages is sufficient to trigger the trigatrons of a particular stage when the previous stage breaks down.

The action of the circuit is as follows: When G₁ breaks down the stray capacitance coupling Ca causes the potential of the hemisphere of T₂ to fall; the trigger rod of T₂ tends to be held at a fixed potential by the stray capacitance from C₂ to earth. Thus a high voltage suddenly appears across the annular gap of T₂, causing breakdown of this gap. Similarly, the stray capacitance coupling C_b causes a spark to occur in the annular gap of the trigatron T_1 . Thus, both the trigatrons T_1 and T_2 are triggered when G₁ breaks down; consequently the spark gap in the second stage of the impulse generator, G2, sparks over with the spacing of this gap much greater than is the case with the circuit of Fig. 3. When G₂ fires a similar effect takes place in G_3 , and so on. Thus all the gaps fire in rapid succession, producing the output impulse voltage. Therefore, the advantage of the new circuit is that the impulse generator operates satisfactorily with its spark gaps $G_2 \dots G_n$ much less critically set than is the case with the conventional circuit of Fig. 3. The new circuit thus overcomes the disadvantages of the conventional circuit, as listed above. The generator will therefore



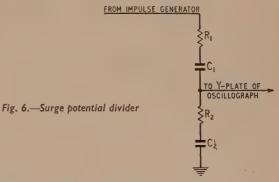
operate over a much greater range of voltage for given spark gap spacings in the various stages than is the case with the conventional circuit. Distributed wavefront resistance can be incorporated in the generator in the same way as in the conventional circuit.

Full details of the new circuit and results showing the improvement derived by its use are published elsewhere.8

Voltage Measurement

The simplest method by which the amplitude of shortduration high-voltage surge waves may be determined is by sphere gap measurements. Standard tables have been drawn up (for certain sizes of spheres) giving the voltage at which a sphere gap of a particular spacing will break down under atmospheric conditions.9 It is therefore an easy matter to measure output voltages in this way, with an error of measurement of not more than about 5 per cent.

A system which is more often used, and one which permits more accurate voltage measurement than the first method, is to display the surge waveform, using a potential



divider, on the screen of a high-speed oscillograph. Such an oscillograph is very desirable in any case, in order to check the waveshape of the output surge voltage. The peak voltage of the trace may be measured directly and, knowing the ratio of the potential divider, the surge voltage calculated. A potential divider of a type sometimes used is shown in Fig. 6. The time constants R₁ C₁ and R_2 C_2 are arranged to be equal. Many modifications and refinements of this circuit exist, the aim in each case being to obtain accurate response without at the same time imposing a drain on the voltage source. The charging voltage is usually measured using an oil-immersed resistance of several hundred megohms in series with an accurate microammeter.

In modern impulse generators operation is carried out from a control room which houses the oscillograph and measuring instruments and from which the impulse generator gap lengths can be adjusted. The impulse generator is usually tripped from a push-button in the control room.

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Aluminium Suspension Clamps

By R. W. FARLEY* and D. W. PADDON, A.M.I.E.E.†

Apart from the low weight and durability of aluminium clamps, recent investigations have shown that conductor temperature is reduced in the region of the clamps and the possibility of local annealing (common with malleable iron clamps) is eliminated

MALLEABLE iron suspension clamps suffer a disadvantage in that they give rise to the generation of considerable quantities of heat as a result of hysteresis losses, and it has been shown by a series of tests carried out at the Aluminium Laboratories, Ltd., that the temperature rise resulting from this heat may be sufficiently great to cause local annealing of the conductor. Aluminium, on the other hand, being a non-magnetic material, does not suffer hysteresis losses, and in fact the experiments showed that an aluminium clamp actually runs at a lower temperature than the unconfined conductor. Thus, the mechanical properties of the conductor are not affected by excessive temperature rise at a point where it is, of course, essential to retain maximum strength.

One of the problems encountered in these investigations was the development of a technique for determining the power losses to an acceptable degree of accuracy. Similar measurements carried out previously in other countries included the use of a wattmeter in the primary circuit of the step-down transformer that supplied the current to the test loop. From measurements taken with and without a clamp in position the losses were calculated. But these measurements include the losses in the transformer and since these may be relatively high they could swamp the losses in the clamps. A further method previously used involved the use of a wattmeter with a low-voltage pressure coil. Some doubt was felt as to the efficiency of this method for these particular tests, bearing in mind the very

† Alcan Industries, Ltd.



Suspension clamps: malleable iron (top) and aluminium (bottom)

low power factor of the test rig, which was of the order of 0-3 lagging.

The method finally adopted by Aluminium Laboratories to evaluate the comparative behaviour of malleable iron and aluminium suspension clamps involved the use of a phase-sensitive voltmeter. This is a fairly complex instrument that is capable of resolving a voltage across a test specimen into two components 90° out of phase with respect to each other. One of these components is arranged to be in phase with a reference voltage derived

from a non-inductive shunt inserted in the circuit, and from this component, plus a current reading, the power loss across the test specimen can be calculated. The reactive or quadrature component values, which in this application represent the eddy currents, form no part of the calculation.

The test specimen for these experiments comprised a short length in a loop of conductor upon which a suspension clamp could be mounted (Fig. 1). A full range of clamps on various sizes of a.c.s.r. conductor were tested, and the relative power loss values were calculated.

Since the power dissipation rate of the



* Aluminium Laboratories, Ltd.



Fig. 1.—Test rig for power loss measurements

bare conductor is regarded as zero with this arrangement, an interesting result in the case of many readings taken on aluminium suspension clamps was that a negative value of power loss was recorded. This is readily explained from the fact that the aluminium clamp provides an additional path for the current flow, without at the same time introducing any appreciable losses to offset the extra conductivity.

With the malleable iron suspension clamps, however, the extra conductivity provided is practically negligible owing to

the higher resistivity of the metal which, being magnetic, gives rise to considerable hysteresis and eddy current losses. The magnitude of these losses in practice is difficult to determine owing to fluctuations in loading, but the results of the experimental work suggest that in certain cases it could be as much as 60 W per clamp.

It became apparent, from the conductor temperature readings, that the heating effects were more serious than power losses, and warranted special consideration. To compare more accurately the temperature rises in conductor held in aluminium and malleable iron clamps, one of each type was applied to single a.c.s.r. conductor and current passed (Fig. 2). Thermocouples embedded under the clamps and at points around the conductor loop indicated that with the aluminium clamps the temperature rise was less than that of the conductor in free air, an expected result from the negative power loss considerations previously mentioned, in addition to which there is, of

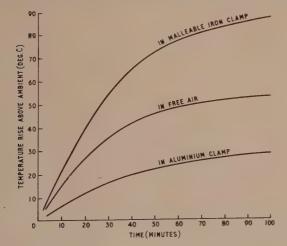


Fig. 3.—Temperature rise of a S4X 7/0125in a.c.s.r. conductor passing 800 A (i.e. cold weather rating)

course, increased surface area for thermal radiation (Fig. 3). With the malleable iron clamps, on the other hand, it was observed that temperatures could be sufficiently high to bring about eventual low-temperature annealing of the

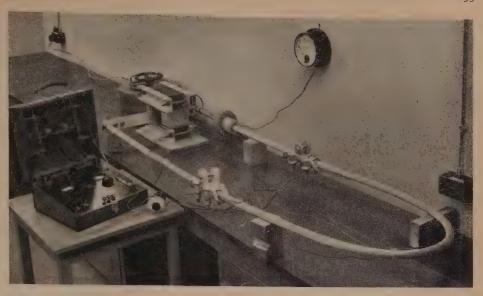


Fig. 2.—Test rig for conductor temperature rise measurements

conductor strands, with the attendant reduction of ultimate tensile strength.

A further hazard is the possibility of migration of the protective grease compound within the conductor away from the zone of the clamp, thus promoting corrosion of the steel core and providing the necessary conditions to permit galvanic action between the steel core and the aluminium strands. Corrosion of this nature would have an aggravating effect, since the corrosion products formed would create a high resistance barrier at the aluminium-steel interfaces which would promote severe burning and pitting of the conductor strands in the event of power flashovers across the insulating strings.

Thus the use of aluminium suspension clamps effects a saving of power which may in many cases be sufficiently great to offset the extra cost. Most important, however, is the fact that by keeping conductor temperatures lower in the region of the clamps, the possibility of local annealing is eliminated, and this makes a valuable contribution towards the reliability of the installation.

Encapsulated Distribution Transformer

AN encapsulated distribution transformer produced by the International General Electric, of New York, eliminates paper insulation and about 99 per cent of the oil from the core and coil, and yet has a dielectric strength claimed to equal that of conventional transformers, as well as being 25 per cent lighter and smaller. The new unit, which will be rated for 80°C average winding temperature rise, incorporates a new epoxy resin developed at the G.E. transformer insulation laboratory.

Encapsulated transformers will be included in a unit for residential use which will include load break disconnect switches and meters which will give consumers complete control in restoring power. Such units will be connected via a service entrance panel containing a low-voltage circuit-breaker whose trip characteristics are co-ordinated with the load capabilities of the transformer to provide full overload protection for the transformer. This will give better voltage regulation by eliminating the need for secondary runs.

Although there are as yet no plans to market the transformer, it is thought that with further development encapsulated transformers can be made at a competitive cost.

FACTORY SHUT-DOWNS

By D. A. DEWISON, A.M.I.E.E.

Electrical system faults can cause factories to shut down. In this article an investigation is made into the behaviour of electric motors, and the machines they drive, when a fault occurs on the supply system to which they are connected; and various factors are enumerated which determine whether a factory will shut down. The method of calculation put forward can be applied to any installation

MOST industrial loads in this country are supplied from the grid through Area Board distribution systems, the supply to the factory being taken via transformers to the factory distribution boards (see Fig. 1). These boards supply the electric power to the factories, the greater part of which consists of electric motors driving the factory machinery.

The factory motor circuits are controlled by some form of switch, which can be categorised into one of two basic types. One type of switch is that which is electrically held in by a solenoid, the supply for the solenoid being taken from the main supply system. In the event of a loss of voltage to the solenoid, the switch trips out and the motor stops. The other type of switch is also solenoid operated, but a mechanism is fitted which "latches in" the main contacts of the switch so that the switch will only

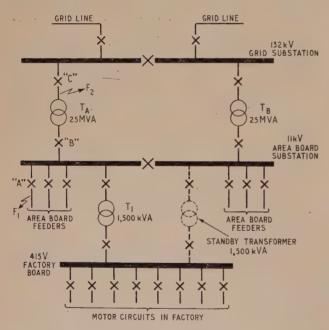


Fig. 1:—Diagram of electrical system

trip if a push-button is operated, i.e. failure of the main supply voltage does not automatically trip the switch. "Latch-in" switchgear is usually fitted to vital motors while "electrically-held" switches are used for the less important drives. The protection fitted to these supply systems is such that electrical faults are isolated in a fraction of a second and the factory supply is maintained through

the healthy part of the system. During the period of the fault the system voltage is reduced, and it is possible that the "electrically-held" switches would trip out, depending on the value of the reduced voltage, the inertia of the switch, and the time duration of the fault. The "latchedin" switchgear would, of course, remain in the closed position.

There may be occasions upon which the rapid protection fails to operate, causing a delay of up to five seconds or more in clearing the fault, and in these circumstances it is possible that a factory might shut down, especially if the fault causes the voltage at the motor terminals to fall to a low value. This is because the "electrically-held" switches would certainly trip, while the motors supplied via "latch-in" switchgear would slow down during the period taken to clear the fault, and might fail to recover speed when the fault was finally cleared. Fortunately, this latter condition rarely occurs, but important factories have been known to shut down in these circumstances.

Effect on Induction Motors

The torque developed by an induction motor is proportional to the square of the voltage; hence, when the voltage at the motor terminals falls, due to a fault on the system, the torque developed by the motor is reduced. If the torque developed by the motor at the reduced voltage is less than that required by the machine which it is driving, then the speed of the motor will tend to fall. There is a certain amount of stored energy in the motor and the machine due to their inertia, which will tend to keep the speed up.

It is possible to determine the reduction of motor speed in any given period of time from the characteristics of the motor and the machine. Fig. 2 shows the characteristics of a motor driving a fan. Fig. 2a shows the characteristics over the whole range, while Fig. 2b indicates the characteristics at speeds near to full load. The current, motor torque and power factor curves are actually the starting characteristics of the motor, and assume normal full voltage at the motor terminals. The deceleration curve is derived from the inertia characteristics of the fan and the motor, and zero voltage at the motor terminals is assumed.

Stability Calculations

Referring to Fig. 1, assume that the 11 kV Area Board substation is supplied from the 132 kV grid by the two transformers $T_{\rm A}$ and $T_{\rm B}$. Also that the factory 415 V

distribution board is supplied from transformer T_1 , the standby transformer being out of service. Assume a three-phase fault occurs at F_1 which takes 1.0 sec to clear, and that during this period the voltage at the factory board is reduced to zero. The fault is finally cleared by circuit-breaker "A" leaving the factory supplied via T_A , T_B and T_1 .

Referring to the characteristics on Fig. 2b; after a period of 1.0 sec the speed of the drive has fallen from 744 r.p.m. to 700 r.p.m. as indicated by the deceleration curve. If the fault is cleared after 1.0 sec, and the voltage on the factory board is restored to the full nominal level (V_n), the current I₈ taken from the supply system by the motor is 3.4 times the normal full load current at a power factor of 0.55 as indicated by the amp curve and the power factor curve. In practice the voltage does not return to the value V_n , but to a lower value V_r , due to the surge current flowing through the system impedance. This in turn has the effect of reducing the current I_s, as derived above, to a lower value; however, the value of this current need not be determined for this exercise, as it is taken into account in the subsequent calculations. In order to determine the total value Is in the system, it is necessary to derive the surge current of the other motors connected to the factory board. This is obtained from the characteristics of each individual motor, in a similar manner to that of the fan indicated above, and then making a vectorial addition.

Having obtained the total value of I_s , and the corresponding power factor ϕ in this manner, it is next necessary to calculate the restoration voltage V_r .

The following formula has been derived by the author to arrive at this voltage:—

$$V_{r} = \sqrt{rac{I_{s}}{I_{r} + 2rac{I_{s}}{V_{n}}X\sin\phi + \left(rac{I_{s}}{V_{n}}
ight)^{2}}X^{2}}$$

where:-

E = no load secondary phase voltage of transformer T₁

X = phase reactance of transformer T_1

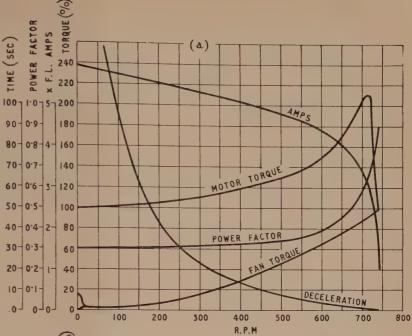
 $V_n = \frac{1}{\text{nominal secondary phase voltage of transformer } T_1$

 V_r = phase restoration voltage of secondary of T_1

 I_s = surge current through T_1 at voltage V_n

 ϕ = power factor of current I_s with respect to V_n

The values X, V_n and E will be provided from tests taken on the transformer. I_s and ϕ are derived from the graphs of the motor characteristics as indicated above.



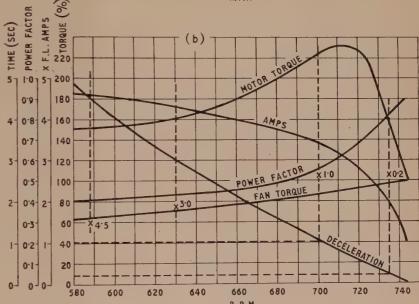


Fig. 2.—Characteristics of a fan motor (a) over the whole range and (b) at speeds near to full load

It will be noticed that the reactances of the cables and the transformers T_A and T_B have been ignored, but this usually has little effect on the final result. If these factors are likely to be significant, the value of X in the above formula can be adjusted by adding the reactance values of the cables and transformers to the reactance of T_A .

Having determined the restoration voltage V_r it is now necessary to determine the torque developed by the motors after the fault has been cleared. Referring to Fig. 2b, a graph has been drawn showing the torque characteristic of the motor based on the assumption of full nominal voltage at the motor terminals. If the voltage were restored to 100 per cent nominal (V_n) on clearance of a 1-0 sec fault, the torque developed by the motor would be 222 per cent as indicated on the graph. Assume that the calculation of

 V_r above resulted in a restoration voltage of 70 per cent of nominal, then the torque developed by the motor would be $(o\cdot 7^2 \times 222$ per cent = 108 per cent (torque varies as V^2). This torque point is indicated on the graph by $X^{1\cdot 0}$. A similar procedure is followed for all the motors connected to the factory board. The above procedure can also be followed for different fault clearance times, and the torque developed by the motors indicated on the graph in the manner shown in Fig. 2b.

Examination of Results

Referring to Fig. 2b, if the speed does not fall below the maximum torque point of the motor, it can be assumed that the motor will recover on clearance of the fault. For speeds below those corresponding to the maximum torque of the motor, it will be seen that the margin of torque between the motor and the machine diminishes, until, at a fault clearance time of 4.5 sec, the torque required by the fan exceeds the torque developed by the motor: hence the drive would not recover speed.

An examination of all the other motors connected to the factory board should be made in a similar manner, and from this it is possible to predict whether a factory will shut down for a given fault clearance time.

The foregoing calculations give the worst result from the point of view of recovery, and there are other factors to be borne in mind when considering the maximum fault clearance time permissible.

It has been assumed that the voltage at the motor terminals during the fault was zero, but if the fault occurred at F_2 instead of F_1 (see Fig. 1), the voltage would be approximately 50 per cent of nominal during the fault; hence the motors would develop 25 per cent torque and would not lose speed as rapidly as in the case of zero volts. The fault would be cleared by breakers "B" and "C" in this condition.

The torque requirement of the fan in Fig. 2 has been assumed as operating at full load prior to the fault, but most industrial drives seldom operate at full load torque. Thus, if the drive was operating at anything less than full load before the fault, it would not reduce speed as rapidly. Both these factors tend to make the factory less liable to shut down under fault conditions.

Methods of Reducing Shut-Downs

It is evident that the restoration voltage is an important factor in restoring the speed of motors and the machines after a fault on the system. Hence any improvement which can be made in the value of the restoration voltage will help in the avoidance of plant shut-downs.

The rating of the transformer supplying the load is an important factor governing the restoration voltage. If the kVA rating of the transformer is larger than the kVA load connected to it, and at the same time the reactance is of a comparatively low value, then the restoration voltage would be improved, i.e. X in the V_r formula would be lower. However, this type of rating would result in an expensive system due to the higher cost of the transformer and associated switchgear. In designing the electrical system, these factors should be correlated to produce a design which will ensure maximum reliability with the minimum cost.

Careful selection of motor protection devices is another method of safeguarding important machines from the effect of system faults. In any factory there are machines and loads which can be shut down for short periods without much disturbance to the running of the factory, and these could be fitted with electrically held switches which trip out on reduction of voltage. Thus in the event of a fault these loads would be tripped off, and the surge currents on the system after fault clearance would thereby be reduced. Meanwhile the important machines having switches with "latch-in" devices would have a better chance of recovery.

Probably the most effective way to guard against shutdown of a factory due to a fault is to design a high quality electrical protective system, which would be given regular inspection and maintenance; then the duration of the fault would not be expected to exceed say 0.5 sec, but this may not always be possible, especially where a factory is supplied from an Area Board system fitted with graded protection.

Copper Conductor Standards

TWO new British Standards, B.S. 3360 and B.S. 3361: 1961 "Copper Conductors in Insulated Cables and Cords," bring together the requirements for copper conductors at present appearing in many British Standards for electric cables. It is hoped in this way to simplify new standards and to make it easier to revise existing standards. The two specifications are concerned only with the conductor in the finished cable, and in this respect resemble B.S. 2791, the existing British Standard for aluminium conductors in insulated cables.

Requirements are given for plain, tinned, annealed and hard-drawn copper conductors of the sizes included in many British Standards for electric cables, but not for the conductors of aircraft cables, telecommunication cables, radio-frequency cables or mineral-insulated cables. In the interest of economical production, more latitude has been given in the make-up of shaped conductors than was permitted by earlier standards. B.S. 3361 is a counterpart in metric units of B.S. 3360, but the metric sizes specified in B.S. 3361 are not direct conversions of those specified in B.S. 3360.

Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.I, price 7s 6d each.

ELECTRIC RAILWAYS BEFORE 1900

The August, 1899, number of Cassier's Magazine was devoted entirely to electric railway traction (largely tramways) and it included eighteen illustrated articles on various aspects of the subject—systems, overhead construction, motors, locomotives and other rolling stock, electrolysis, etc.—by eminent writers of the day. As an account of the state of the art at the close of the last century it is a historical document: so much so that the Light Railway Transport League (245, Cricklewood Broadway, London, N.W.2) considered it to be worth reproducing in full in book form (276 pages).

This has been well done by W. J. Fowler & Son, Ltd., and is available from the League at the price of 50s. In the preface acknowledgment is made to *Mechanical Handling* (an Iliffe journal), successor to *Cassier's Magazine*, for permission to make the reproduction.

UNDERFLOOR HEATING

- a householder's view

By W. A. PULLMAN, Ph.D., A.M.I.Mech.E.*

Most of the articles which have been published on the merits of various forms of central heating have been written by architects, heating engineers and others with a similar professional interest. This article presents a user's point of view and indicates the factors which led to the choice of electric floor heating and gives the running costs over three winters

AFTER some years' residence in the United States and Switzerland the author and his wife returned to this country to build a "dream" house incorporating many of the ideas seen abroad. The choice of a heating system was helped by the first-hand experience abroad of eight examples of warm air and hot water radiator systems both solid fuel and oil fired.

The design of the house was entrusted to Cecil Ogden & Son, L.R.I.B.A., Lutterworth, near Rugby, and the ground floor plan is as shown in Fig. 1. An open plan style was adopted to give ample play area for the children and also to exploit the rural views. The house has three bedrooms and an overall floor area of 1,500 sq ft.

Two heating systems were considered initially, one involving hot water radiators and the other ducted warm air. For the radiator system the design parameters were, a ground floor temperature of 70°F and a bedroom temperature of 60°F with an ambient of 25°F. The estimate of this heating requirement and to supply hot water to a family of four including two small children was 76,500 B.Th.U./hr. Radiators having a total heating surface of 266 sq ft were specified and the cost of the system was estimated at £360 plus £90 for a boiler, making a total of £450. This system was taken as the norm for costing purposes.

Tenders were next invited for warm air systems. Two

quotations were received, one for solid fuel and one for oil. In both cases there was to be a central heating unit containing a hot water cylinder situated in the utility room. Warm air was to be ducted to each room. A solid fuel unit rated at 35,000 B.Th.U./hr and reckoned to maintain a ground floor temperature of 60/65°F, i.e. background heating, was offered at £396. The oil-fired unit with a capacity of 50,000 B.Th.U./hr was recommended as being suitable for maintaining a ground floor temperature of 70°F with an ambient of 30°F. This unit was priced at £476. Closer inspection of the tenders revealed that a considerable amount of builder's work was involved. A frame of 4in insulation blocks was required to contain the heating unit and the ducts in the concrete ground floor were to be lined on four sides with 2in insulation boards. The builder's estimate for this additional work was £120. The only effective central heating system by warm air would thus have cost £596. It was interesting to note the structural complexity of the unit and the insulation requirements and to compare them with current American practice. At least one mail order company in the United States will design a suitable heating system for a house and will supply all the components as a "doit-yourself" kit.

A hot water radiator system was considered, but it was

* College of Engineering Technology, Rugby.



Fig. 1.—Ground floor plan of 1,500 sq ft house

not entirely acceptable due to limitations which it would

impose on the positioning of furniture.

It was at this juncture that the architect suggested electric under-floor heating. Of the systems available at that time (late 1956), it was felt that the "Calidec" system, in which p.v.c.-coated cables are laid directly into the concrete screed, was the most promising. The complications and expense of the rewirable system were not considered to be justified in view of the unlikelihood of a failure and the accuracy with which cable faults can be detected.

An installed capacity of 7.35 kW was recommended, distributed as follows:—Living room, 3 kW; dining room, 1.7 kW; kitchen, 0.7 kW; hall and w.c. 1.15 kW; and study, 0.8 kW. The price was £131 excluding the cost of a time switch to be supplied by the electricity authority for providing power at a reduced rate during off-peak hours. A resin bonded glass fibre quilt was installed 3ft in from the outside walls and 2ft down at a cost of £30. Domestic hot water and radiators on the landing and in the bathrooms were supplied by a solid fuel boiler rated at 35,000 B.Th.U./hr, the cost of this heating circuit being £130. The total cost of the heating and hot water systems was thus £291, which at current mortgage rates represents a substantial economy over the alternative systems.

The installed heating capacity in the house is thus $7.35 \text{ kW} \times 3,413 + 35,000 = 60,000 \text{ B.Th.U./hr}$ which is a figure comparable to alternative schemes. It was computed that even with the higher running costs of the electrical system vis-à-vis one employing coke it would take 20 years to overcome this difference when allowing for mortgage interest. This would be a sufficient time to enjoy the convenience of electricity without paying extra for the privilege. The heating cables were laid under wire mesh and $2\frac{1}{2}$ in screed topped by plastic floor tiles in the kitchen, hall, w.c. and study and by rin Sapele wood blocks in the dining and living rooms. Each room has a separate thermostat and the estimated consumption for a heating season of 210 days was 10,875 kWh.

Operating Experience

With the exception of the kitchen thermostat, which was set at 60°F, the ground floor rooms were maintained at around 70-72°F for the heating season 15th October to 1st May. With such ground floor temperatures the bedrooms were usually at about 55°F and only rarely was the use of an electric convector heater necessary. The bathroom and landing temperatures did not fall below 65 to 67°F. In very severe weather and for visitors unaccustomed to central heating a log fire would be lighted in the living room during the evening.

For three winters the electricity consumptions have been 11,838, 11,778 and 11,960 kWh, representing costs of £37, £36 and £38 respectively. Solid fuel for the boiler cost £22, £20, and £19, while electricity for lighting, cooking and hot water in summer cost £26, £36 and £35 for the same three years. The annual expenditures for light and heat were thus £85, £92 and £92. In return for this a moderately large house was kept comfortably warm and young children could play without any fear of chills and draughts. The heating system had no adverse effect on the plastic floor tiles, but a second visit by the wood flooring contractors was necessary to take

up a certain amount of shrinkage which had occurred. Shrinkage was most noticeable under a heavy hearth rug. The habit was later developed of rolling up the rug on retiring at night since when no trouble has been experienced. Altogether the system can be considered to be quite satisfactory in this installation—and for a keen gardener has an added advantage of being an excellent seed propagator!

Programme for Eastbourne

THE full programme for this year's British Electrical Power Convention (Eastbourne, 12th to 15th June) has now been issued. The president is Sir John Pickles, B.Sc., M.I.E.E., chairman of the South of Scotland Electricity Board, and the vice-president Sir William McFadzean, C.A., Companion I.E.E., chairman and managing director of British Insulated Callender's Cables, Ltd.

The Convention will open at the Winter Garden (at which all the business sessions are being held) at 3 p.m. on Monday, 12th June. There will be a welcome by the Mayor of Eastbourne after which Sir John Pickles will deliver his presidential address. A reception by the Mayor and Mayoress, followed by a dance, will be held on the Monday evening (8 p.m. onwards). Also on Monday the local Rotary Club will entertain Rotarian delegates at luncheon (Drive Hotel, 1 p.m.).

The proceedings on Tuesday, 13th June, will open at 9.30 a.m. with a paper by Sir Christopher Hinton, K.B.E., F.R.S. (chairman, Central Electricity Generating Board) on "The British Electricity Transmission System." At the Grand Hotel (12.15 for 12.45 p.m.) the customary luncheon of the Electrical Association for Women will be held. In the afternoon (2.45 p.m.) Mr. R. R. B. Brown, B.A., B.Sc. (chairman, Southern Electricity Board) will present a paper on "Some Aspects of Efficiency and Economy in Distribution." No official function has been arranged for Tuesday evening. During Tuesday the ladies will be able to visit the "Garden Centre Flowerland" at the invitation of Scotts of Eastbourne.

At the morning session, opening at 9.30 a.m. on Wednesday, 14th June, a paper on "The Electrical Power Industry in Canada" will be read by Mr. A. E. Grauer, B.A., Ph.D., LL.D. (chairman and president, British Columbia Electric Co., Ltd.) and in the afternoon (2.45 p.m.) Mr. S. F. Steward, C.B.E. (director, British Electrical and Allied Manufacturers' Association) will present a paper entitled "British Electrical Manufacturing in the National Economy." The annual dinner will be held on the Wednesday evening (7 for 7.30 p.m.) at the Grand Hotel and a dance at the Winter Garden will also take place (9 p.m. to 1 a.m. Thursday).

For the morning of Thursday, 15th June (10 a.m.), a repetition of the popular "Electrical Forum" is being arranged. The president will act as "question master" and the panel of experts will consist of Mr. F. H. S. Brown, C.B.E., M.I.Mech.E., M.I.E.E. (deputy chairman, C.E.G.B.), Mr. Sebastian Z. de Ferranti (managing director, Ferranti, Ltd.), Mr. A. A. Fulton, C.B.E., B.Sc., M.I.C.E., M.I.Mech., M.I.E.E. (general manager, North of Scotland Hydro-Electric Board) and Sir Robertson King, K.B.E. (chairman, Electricity Council). The Convention will end with the annual general meeting at noon.

New A.T.V. Studios



The new Elstree studio centre of Associated Television, Ltd.

A—Studio B. C—Studio C. D—Studio D. E—Administration block. F—Rehearsal rooms. G—General technical facilities. H—Studio facilities. I—Boiler house and mechanical plant. J—Restaurant and lounge. K—Wardrobe, make-up and dressing rooms. L—Orchestral and dubbing theatres

HEN completed in a few months' time, Associated Television's new Elstree studio centre will have a total studio floor area of 32,000 sq ft, more than any other studio centre in this country. Studio A (80ft by 80ft) and studio B (84ft by 80ft) are nearing completion, while studios C and D (each 116ft by 80ft) are already operational, less than twelve months since the commencement of site work. The total estimated cost of the new centre, which was opened last week by Dr. Charles Hill, Chancellor of the Duchy of Lancaster, will be £4 million, including about £1 million for technical equipment.

Associated Television, Ltd., began operations in 1955 as the programme company for London at the week-ends and for the Midlands during the week. It soon became apparent that the existing scattered studios were inadequate for efficient operations on a long-term basis. Consequently, a 7½-acre site on the South Bank of the Thames was acquired by A.T.V., but it then became clear that long-term development of this Vauxhall site would not be in time to meet the urgent needs of the service. Accordingly, as a large-scale intermediate measure, it was decided that the company's film studios at Elstree should be rebuilt as television studios. In the result, the Elstree studio centre, which incorporates much advanced technical equipment, will be capable of providing a full seven-day-a-week television service.

All equipment is capable of operating on 405- and 625line 50-frame and 525-line 60-frame standards. For the 60-frame standard, a 40 kVA, 50-60 c/s frequency changer has been installed. Completely transistorised equipment has, for the first time, been used for all pulse generating and distribution apparatus as well as all video distribution and mixing units. Most of this equipment has been designed and constructed by the planning and installation department of A.T.V. The vision mixer panel and associated apparatus are entirely of A.T.V. construction, the whole mixing operation being effected by the use of germanium diodes. This provides inter-frame cutting, that is, the picture cuts in the frame blanking period.

In conventional studio lighting schemes, the lamps are usually fixed to portable floor-standing supports and supplied by trailing cables. In a recent installation, however, the lamps have been suspended from the ceiling and raised and lowered by electric winches, the winches themselves being fixed in position.

At Elstree, all lamps are carried on extendable telescopic

Producer's view from control room into studio D





The transistorised 16-way video distribution amplifier occupies about a quarter of the space of conventional equipment with a tenth of the power consumption and heat dissipation

supports suspended from a false ceiling or "lighting grid" on which they can be moved both across the studio and from end to end. Complete freedom of movement in all three dimensions is thus achieved and the studio floor is kept free for production purposes.

In the design of the studio lighting, sufficient power has been provided to cover the requirements of colour television. In all, there are 240 circuits per studio, 200 of these being rated at a 2 kW tungsten lamp load each, and the remaining 40 at 5 kW each. The lighting load for an average programme, at present, is 100 kW, but a reasonable production can be obtained with only the 29 kW of general lighting in operation. A 110 V Nife battery has been provided for emergency lighting.

The intensity of each of the 240 studio lighting lamps

Close-up of the lighting grid in the studio ceilings



can be individually controlled by remote operation from the lighting control room. The control desk occupies a floor space of only 5ft by 6ft and the operator is within reach of all controls for 240 individual dimmer channels. Not only can the intensity of each lamp be precisely set, but each dimmer can be pre-set two changes in advance. In addition, an instantly adjustable memory device can record and recall 20 different lighting combinations. The operation of any one of these memory channels, by a single pushbutton operation, will automatically adjust the intensity of individual lamps according to the pre-set programme. The operator is also able to adjust any single lamp to suit the needs of the moment without jeopardising any future lighting change recorded in rehearsals.

Each of the 240 dimmers are of the auto-transformer type and are servo operated through a magnetic clutch



The production lighting control room showing the dimmer control panels and the console manufactured by the Strand Electric & Engineering Co., Ltd.

drive. The complete remote control equipment for the production lighting consisting of the control desk, the relay cabinet containing the memory device and all low-voltage control relays, and the dimmer bank, have been supplied for each of the four studios by the Strand Electric & Engineering Co., Ltd.

Each studio contains five Pye 4½ in Image Orthicon cameras, while in the sound control room, equipment has been installed which can mix up to 34 sound channels. Power supplies to the video equipment have to be stabilised and a 12-16 kVA Claude Lyons automatic voltage regulator is installed in each studio's vision control room.

The main contractors are Sir Robert McAlpine & Sons, Ltd., Marryat & Place, Ltd., being responsible for the electrical installations.

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ICAL REVIEW 14 APRIL 1961

55 (Apvr)

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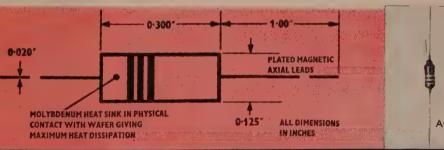
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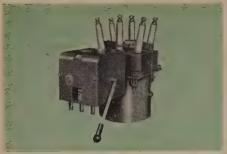
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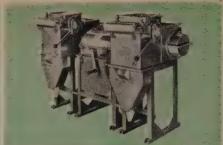
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15 kV Oil Circuit Breaker for cubicle mounting



Heavy Current D.C. Circuit Breaker and Knife Switch Panel



H.V. Ring Main Switchboard with Fuse Switch controlling Tee-Off



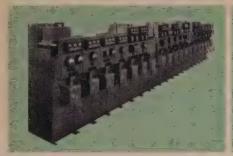
Small Air Circuit Breaker



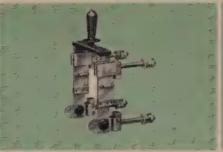
Ammeter and Voltmeter Switches



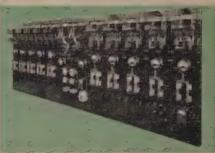
L.V. Industrial Oil Circuit Breaker



II kV Metalclad Switchboard



Panel Mounting Knife Switch



D.C. Switchboard for Steel Works



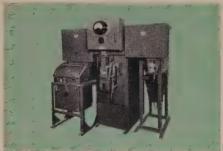
T.P. II kV Isolating Switch



Current Transformers



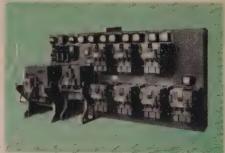
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H.V. Switchboard incorporating Automatic Fuse Switch



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Industrial Switchboard with Drawout
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VIEWS on the NEWS

By "REFLECTOR"

BJECTIONS to the routing of a transmission line from the Dungeness nuclear power station, now being erected, across East Sussex to Shermanbury were raised at a recent meeting of the Cuckfield Urban Council. One member said that it was "going to take the judgment of Solomon on the part of the County Council's planning committee to decide between the views of various local authorities." My recollection of that judgment was that Solomon ruled that a disputed child should be divided between two women claimants, whereupon one of them gave way and thus showed that she was the true mother. How that could be applied to a transmission line beats me.

* * *

What are called "faculties" have to be obtained for additions and alterations to churches and churchyards. At a consistory court held at Chichester recently permission was sought by the Southern Electricity Board to place a substation in a disused burial ground at All Saints' Church, West Pallant, Chichester. This request for a faculty for this unusual purpose was supported by the vicar and the church council who considered that there was no disrespect to the dead in providing desperately needed electricity for the living; the churchyard had not been used for over 90 years. The Board had been unable to obtain another site in the neighbourhood and it promised that there would be little disturbance. The Chancellor reserved his decision until later this month.

* * *

Reporting a gathering of the Woodmansterne Women's Institute, the Epsom and Ewell Herald says that

"a pleasant aroma of spring flowers and baking filled the Methodist Church Hall for the March meeting. This was because the South Eastern Electricity Board gave a demonstration on cheese cooking and because there was a hyacinth-growing competition."

Is an aroma compounded of hyacinths and cheese all that pleasant?

* * *

While our National Coal Board is spending a great deal on publicising the virtues of coal for heating the home, the United States coal industry appears to have accepted the idea that the future of home heating lies with electricity. At a recent symposium on the subject held by the National Coal Policy Conference (reported by the New York Electrical World), the president of the Conference, Mr. Joseph E. Moody, said that the coal industry was constantly trying to find new markets and "now it looks as if electric heating is the market they have been searching

for." I note, too, that a representative of the miners' trade union also approved the use of electricity for domestic heating; British miners do not generally realise that electric heating is as much, or more, to their advantage as heating by raw coal. They should be aware that oil, not electricity, is the rival likely to do their industry harm. It was mentioned at the meeting that electrically-heated homes were increasing at the average rate of 21 per cent annually, but at the last count there were only \$50,000 of them, while gas-heated homes numbered 27.7 million.

* * *

Pocket-sized freezers, "Frigistors," are being produced by a Montreal company. In reporting this, the Canadian Financial Post (overseas edition) says that the freezers "are solid-state devices in which electro-gas performs the function of the refrigerant." The newspaper also states that they "are finding application in medical, military and research fields and are showing signs of becoming a hot export item." I rather like that last remark.

* * *

The Scottish Sunday Express reports a generous gesture on the part of the South of Scotland Electricity Board. A party being held by an old age pensioners' club at Denny, Stirlingshire, was spoiled by an electricity "black out" some time ago. To compensate the pensioners for this the Board put on a show of its own at the club—with tea and cakes. One of the Board's officials explained:—

"We don't give many concerts and only in connection with business. But, in a way, this is business for they are not only pensioners but consumers. One of our own engineers is one of the artists."

It is worth while for national boards to show a little humanity in this way. Too often they are regarded as soulless machines.

* *

One of the advertisements in the *Electrical Review* of 15th April, 1881, was that of W. T. Glover & Co., insulated wire manufacturers, who announced that their specialities were:—

Specially-covered Gutta-percha Wire for Leading-in, Tunnels, and Underground Work. Specially-covered Iron Wire for Aerial Lines. Fancy-covered copper wire (Paraffined) for telephonic and bell purposes. Cotton-covered Gutta-percha wire for bellwork. Special makes of electric light leads for the Brush, Gramme, &c., systems. All classes of covered wire and cables for telegraphic, telephonic, and electric work, as supplied to the Post Office and the Principal Railway and Telephone Companies.



Capt. G. S. Turner (Admiralty), Sir Hamish MacLaren (President, I.E.E.), Mr. C. R. Waterhouse (president, E.C.A.) and Brig. W. G. S. Thompson (National Inspection Council)



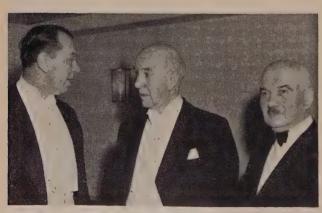
Sir Edwin Herbert (president, E.D.A.), Mr. S. F. Steward (director, B.E.A.M.A.), Sir William McFadzean (president, F.B.I.) and Mr. F. H. S. Brown (deputy chairman, C.E.G.B.)

A.S.E.E. ANNUAL DINNER

THE annual dinner and reunion of the Association of Supervising Electrical Engineers, held at Grosvenor House, London, last Friday, was attended by more than 1,000



Lord Fleck (chairman, Minister of Power's Advisory Council on Research and Development), Mr. J. H. K. Pendry (past-president, A.S.E.E.) and Col. B. H. Leeson (chairman, Board of Governors, Faraday House Engineering College)



Hon. H. G. Nelson (managing director, English Electric Co., Ltd.), Sir Josiah Eccles (immediate past-president, A.S.E.E.) and Sir Ben Barnett (chairman, Commonwealth Telecommunications Board)

members and guests. Owing to the fact that he was at the centenary celebrations of the Massachusetts Institute of Technology in the United States, Sir Willis Jackson, president of the Association, was unable to be present and his place was taken by Sir Josiah Eccles, the immediate past-president.

The toast to the electrical industry and Association was proposed by Lord Coleraine, chairman, National Youth Employment Council. He began by jocularly tracing the development of electricity from the earliest days, referring to Ampère, Volta, Ohm, Watt and Faraday. He said that the electrical industry was taking a great deal of drudgery and toil out of life, which gave people more time to think—and to watch television. However, he thought that in the long run television would raise, rather than lower, standards and would develop critical faculties in people who did not normally have critical minds.

Referring to the National Youth Employment Council, he said that there was a tremendous waste of talent today and something must be done to put this right. The proper employment of young people was of paramount importance and the electrical industry could do a great deal in this direction. The vital importance of providing more training facilities was emphasised by the fact that the Duke of Edinburgh would shortly be launching the Commonwealth Training League.

The response on behalf of the I.E.E. was made by Sir Hamish MacLaren, who said that the A.S.E.E. and the I.E.E. had a long and happy period of co-operation, particularly in regard to education and training. He also referred to the A.S.E.E. exhibitions and said he hoped that these would long continue. Mr. G. G. Kitchener, chairman of the Association, responded.

The toast to the guests was proposed by Sir Josiah Eccles. Referring to the valuable function of the A.S.E.E., he said that it filled the gap between "the long-haired ones and the crew cuts." Finally, in view of the fact that it was Sir Hamish MacLaren's birthday, he handed him a present on behalf of the Association. A brief response was made by Sir Robert Fraser, Director General, Independent Television Authority.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. H. J. Fraser, M.I.E.E., the new president of the Electrical Power Engineers' Association, received his technical education at the Harris Technical



Mr. H. J. Fraser

Institute, Preston, and Liverpool University, and he was apprenticed at the Dick Kerr works of the English Electric After ten years with the Yorkshire Electric Power Co., joined the Liverpool Electricity Depart-

ment. Towards the end of the last war Mr. Fraser was seconded to the Fulham Corporation Electricity Department to give assistance in London during the difficult flying-bomb and rocket period. When the electricity supply industry was nationalised he became district commercial engineer of the Central Liverpool District, Merseyside and North Wales Electricity Board.

Mr. Fraser joined the E.P.E.A. in 1942 and has held numerous offices including long service on the National Executive Council and chairmanship of the Association's national education and training sub-committee. He is a member of the National Joint Board and the National Joint Advisory Council for the Electricity Supply Industry.

The following appointments have been made by the Central Electricity Generating Board in the newly created Regional Electrical Department which will be responsible for all transmission construction work in the Midlands and East Midlands Region as well as the co-ordination of commissioning tests on protective gear, metering, communication equipment and system electrical development : - Regional engineer, Mr. W. W. Smith, B.Sc., M.I.E.E., M.Brit.I.R.E.; regional transmission project engineer, Mr. J. D. Pierce, M.I.E.E.; and regional technical and development engineer, Mr. L. B. Wood, Ph.D., B.Eng., A.M.I.E.E.

Mr. Smith has been technical engineer of the East Midlands Division since 1948. He received his practical training with the Birmingham Electric Supply Department and was subsequently with the Brush Electrical Engineering Co., the G.E.C., and at Nechells power station before joining the Central Electricity Board in 1931.

Mr. Pierce started with the Oxford Electric Co., Ltd., and gained further experience with the Wessex Electricity Co., Ltd. In 1929 he joined the Central England Area of the C.E.B. and was transferred to the Nottingham Transmission Section in 1932. When the industry was nationalised he was appointed a senior assistant transmission engineer, East Midlands Division. and was promoted to divisional transmission engineer in 1949.

Dr. Wood joined the English Electric Co., Ltd., in 1935 and in 1948 was appointed system development engineer in the South Eastern Division of the then B.E.A. From 1950 to 1959 he was senior assistant technical engineer in the Midlands Division and since then has been assistant divisional electrical engineer responsible for the transmission construction, development and technical sections.

The board of the General Electric Co., Ltd., on Tuesday announced the election of Sir Toby Low, Conservative M.P. for Blackpool North, as vicechairman of the company.

Manager of the Aylesbury District of the Eastern Electricity Board since vesting day, Mr. F. Bent, M.I.E.E., A.M.I.Mech.E., retires at the end of May after 47 years in the electricity supply industry. Mr. Bent started with the Bolton Corporation Electricity Department in 1914 and was senior shift charge engineer of the generating station before his appointment as station superintendent at Aylesbury in 1939. He was promoted deputy borough electrical engineer in 1935, to which the responsibilities of manager were later added.

Mr. Bent's successor at Aylesbury



Mr. F. Bent



Mr. B. G. Neden

is Mr. B. G. Neden, Associate I.E.E., at present manager of the Cambridge Branch of the Fens Sub-Area. Mr. Neden began his career in the supply industry with the Beds., Cambs. & Hunts. Electricity Company, becoming manager of the St. Neots Branch in 1946. Since nationalisation he has been district commercial engineer at Cambridge and senior assistant engineer (commercial) at the Fens Sub-Area headquarters.

The British Electrical and Allied Manufacturers' Association announces the appointment of Mr. R. W. K.



Blagbrough secretary of the B.E.A.M.A. Electric Traction Section. Mr. Blagbrough left Nottingham University in 1940 and served during the war in the Radio Branch of R.E.M.E. After Mr.R.W.K.Blagbrough the war he joined the Transformer

Department of Ferranti, Ltd., and in 1951 was appointed a member of the technical sales staff. He joined the B.E.A.M.A. in December, 1959, and was primarily concerned with exports of transformers. In recent weeks Mr. Blagbrough has visited a number of works of member companies of the Electric Traction Section to see at firsthand the design and production facilities and to discuss commercial matters of common interest.

The North Western (Manchester) Area Golf Committee is holding its area qualifying competition for the Electrical Industries National Golf Championship at the Stockport (Torkington) Golf Club on Wednesday, 3rd May. Full particulars can be obtained from Mr. E. Hodgson, of Switchgear & Cowans, Ltd., Old Trafford, Manchester, 16.

Mr. L. R. Blake, Ph.D., B.Sc.(Eng.) (Hons.), A.M.I.E.E., has been appointed to the new post of director of engineering of the Brush Electrical Engineering Co., Ltd., and has joined the board as an executive director. Dr. Blake was head of the Electrical Section Research Laboratory of the B.T.H. Co., Rugby, from 1949 to 1956. He then joined the United Kingdom Atomic Energy Authority and held the position of fast reactor technology manager at Dounreay, Caithness, before joining the Brush Co.

Mr. T. S. Jones (Crompton Parkinson, Ltd.) who, as we have reported,



Mr. T. S. Jones

has been elected president of the Electric Light Fittings Association for 1961, has served continuously on various committees of the Association since 1942. In taking over his new position, Mr. Jones relinquishes the

chairmanship of the industrial and commercial sections, but retains the chairmanship of the recently formed Import/Export Committee.

A new grade of executive has been introduced into the management structure of Oldham & Son, Ltd., and the following four appointments as "executive managers" are announced. Mr. A. H. Gray (assistant sales manager, S.L.I. Division); Mr. A. Hardy (chief chemist); Mr. J. K. Marshall (traction sales manager); and Mr. J. Pangburn (chief accountant).

Mr. E. Keith Long, B.Sc.Tech., A.M.I.E.E., managing director of Long & Crawford, Ltd., Manchester, has been appointed to the board of Lloyd's Packing Warehouses (Holdings), Ltd. Mr. Peter W. Long, director and secretary of Long & Crawford, Ltd., has joined the board of Packaging Products (Holdings), Ltd.

Mr. W. A. C. Maskell, B.Sc.(Eng.), M.I.E.E., F.B.I.M., Sen.M.I.R.E., general manager of the General Elec-

tric Co., Ltd.'s Telecom munications Group at Coventry since 1959, has been appointed managing director of the Mr. Group. Maskell joined Coventry telephone works of the G.E.C. as Mr. W. A. C. Maskell a post - graduate



apprentice in 1925; in 1928 he became an equipment designer in the radio development laboratory and in 1931 moved to head office to act as technical liaison officer between the Radio Sales Department and the Coventry works. He was made chief engineer of the G.E.C. radio sales service organisation at head office in 1935. From 1942 to 1946 he was chief engineer to the G.E.C. wartime factories at Bradford and on returning to London became deputy manager of the Radio Department. Five years later he moved back to Coventry as general manager of the radio works. From 1958 to 1959 Mr. Maskell held the position of manager (organisation), Telecommunications Group.

Following the retirement of Mr. G. A. Marriott, who was the first president and chairman of the Electronic Valve and Semi-Conductor Manufacturers' Association (VASCA), Mr. S. S. Eriks, O.B.E. (managing director, Mullard, Ltd.), has been elected president and chairman of the Council and Mr. C. A. W. Harmer, O.B.E. (a director of Pye, Ltd.), has been elected chairman of the Association and chairman of the General Management Committee. appointments cover the remainder of the Association's year to 30th June next.

Mr. J. Bell (managing director of the M.O. Valve Co., Ltd.) has been elected vice-chairman of the British Radio Valve Manufacturers' Association (BVA) in succession to Mr. G. A. Marriott.

The Eastern Region of British Railways announces the appointment of Mr. E. C. E. Lyon as electric traction engineer, Ilford, in the Department of the Chief Mechanical and Electrical Engineer. He succeeds Mr. G. A. B. Leishman, who has retired.

The Council of the Institute of Metals has appointed Mr. R. E. Moore as secretary in succession to Lt.-Col. S. C. Guillan, T.D., who retires at the end of this month.

Mr. D. J. Chapman has been appointed sales manager of Telequipment, Ltd.

Mr. A. W. Henderson, Ph.D., B.Sc., has been appointed as chief chemist/ metallurgist of the Plessey Co., Ltd.

Mr. D. L. Rigby, M.A., education and training officer in the Development and Engineering Group of the United Kingdom Atomic Energy Authority, has been appointed assistant secretary (education) to the North Western Electricity Board. Mr. Rigby, who is 35, was educated at Hindley and Abram Grammar School and St. John's College, Cambridge. Before joining the Atomic Energy Authority he was a senior scientist with the British Scientific Instrument Research Association. He had previously been employed at the Royal Aircraft Establishment, Farnborough.

Mr. F. H. McCrea has retired from the position of managing director of the Dubilier Condenser Co. (1925), Ltd., but continues as chairman and senior executive director. Mr. J. Goodman and Mr. J. H. Cotton have been appointed joint managing direc-

Mr. E. F. Martin has been appointed a managing director of the Franco-British Electrical Co., Ltd.

Mr. A. H. Birch has been appointed manager of the "Westair" Division of Westool, Ltd., which produces air conditioning equipment.

M.I.E.E., V. Ely, M.I.Mech.E., has been appointed consultant to Gresham Transformers,



Mr. R. V. Ely

Ltd., to advise the company on transformer applications in the fields of arc welding and Xtechnology. ray Mr. Ely was with the Foster Engineering Co., Ltd., which, in 1925, became Foster Transformers, Ltd. In 1935 he

was appointed production director and in 1946 managing director when the company became associated with the Lancashire Dynamo Group. He was appointed research director to the group in 1956, retaining his seat on the board of Foster Transformers. In 1959, until the merger of the L.D. Group with Metal Industries, Ltd., he served as executive vice-chairman. Since the merger he has been a director of Roberts Holdings, Ltd., public works contractors, and Micro X-Ray Laboratories, Ltd.

Mr. G. O. Pritchard, M.Inst.T., who relinquished the position of traffic manager of Associated Electrical Industries, Ltd., at Rugby last December but remained in the service of the company as consultant, has retired.

Mr. Brian M. Lee, manager of the Industrial Division of Belling & Lee, Ltd., has been appointed to the board of executive directors of the company.

Mr. D. R. Crow, A.M.I.E.E., assistant general sales manager of the Benjamin Electric, Ltd., leaves London by air on 16th April for a business tour of the Scandinavian countries. He will be returning to London on 28th April.

Mr. H. L. Satchell, M.B.E., F.I.W.M., director of manufacture, Associated Electrical Industries



Mr. H. L. Satchell

(Rugby), Ltd., retired last week: he had been with the company for 41 years. After service in the 1914-18 war, first in the Army and then in the Royal Flying Corps, in which he attained the ranks of captain and flight commander, Mr.

Satchell, in 1920, commenced an apprenticeship with the British Thomson-Houston Co., Ltd. Gaining a B.T.H. fellowship, he spent a year with the General Electric Company, U.S.A., and on his return he became technical assistant to the head of the Winding Department. In 1929 he was appointed planning engineer, in 1940 assistant manager, and in 1945 manager, Rugby works. Mr. Satchell became a director of the company in 1949, deputy director of manufacture in 1955, and director of manufacture in 1957.

W.S. Electronics, Ltd., have appointed Mr. P. Corcoran as contracts manager.

At a recent ceremony held at the A.E.I. offices in Charing Cross Road, London, presentations were made to Mr. Alan S. Brewer, whose resignation from the position of advertising manager, Cables and Construction Division, and deputy group advertising manager of Associated Electrical Industries (Woolwich), Ltd., was re-



Mr. E. J. Vidler making the presentations to Mr. Alan S. Brewer

ported in our 31st March issue. Mr. E. J. Vidler, general manager of the A.E.I. Cable Division, handed Mr. Brewer a model of a greenhouse which he is to buy with a cheque contributed by his colleagues throughout the company, and a camera from fellow members of the Staff Dinner and Students' Conversazione Committees in appreciation of his services on these committees for many years. His own department presented him with a set of coffee tables.

Mr. H. W. Golding, A.M.I.Mech.E., deputy station superintendent, Elland power station, Yorkshire Division, since 1959, has been appointed station superintendent of the Ffestiniog pumped storage power station, Ffestiniog, North Wales, from 1st April, 1961.

Mr. J. Mortimer Hawkins was in the chair at the seventh annual general meeting of the Electrical Industries Club held at the Connaught Rooms, London, on Tuesday last.

The General Committee's report, circulated in advance, gave an account of the past year's activities. At the end of 1960 the Club membership was 375, an increase of 29. The total amount collected at the luncheons during the year for the funds of the E.I.B.A. was £255, exceeding the figure for the previous year by nearly £44. Appreciation was expressed to Mr. Arthur Lowe, hon. secretary and treasurer, and Mr. Colin Campbell, hon. social secretary, for services rendered. The accounts showed that the Club's finances were in a healthy state.

The four vacancies on the General Committee were filled by the reelection of Messrs. J. Mortimer Hawkins, J. J. Thompson and H. F. Wickham and the election of Mr. J. Flood. Mr. E. A. V. Peckham (G. S. Peckham & Co., Ltd., electrical wholesalers) was elected president to succeed Col. B. H. Leeson and Mr. Batt was re-elected vice-president. Messrs. Campbell and Lowe were re-elected hon. social secretary, and secretary and treasurer respectively.

Approximately 150 members and guests attended the subsequent luncheon at which Col. Leeson presided for the first part. He introduced Mr. Peckham and invested him with the presidential badge. The new president then introduced the guest speaker, Mr. Bernard Newman, the well-known author of spy stories, who gave a most entertaining address on the intriguing subject of espionage.

Following the vote of thanks to the speaker, Mr. Mortimer Hawkins presented Col. Leeson with a book dealing with the consequences arising out of the construction of the Kariba Dam as a token of the Club's appreciation of his services during his term of office.

OBITUARY

Sir Alexander Roger, K.C.I.E.—The death occurred at his home at Binfield, Berks., on 4th April of Sir Alexander Roger, honorary president of British Insulated Callender's Cables, Ltd., and the Automatic Telephone & Electric Co., Ltd. He was 93. Sir Alexander, who was educated at Robert Gordon's College, Aberdeen, joined the board of British Insulated & Helsby Cables, Ltd., in 1918, and was elected chairman in 1930. On his retirement in 1954, the directors of B.I.C.C. founded a travelling scholarship bearing his name in recognition of his services. In



The late Sir Alexander Roger

the early 1920's Sir Alexander joined the also board of the International Automatic Telephone Co., Ltd., and the Automatic Telephone M a n ufacturing Co., Ltd. These companies were s u b sequently merged to form

the Automatic Telephone & Electric Co., Ltd., of which he later became chairman. He had also served on the boards of a number of other companies and, until relinquishing the duties last year, was chairman and managing director of the Telephone & General Trust and the Anglo-Portuguese Telephone Co., Ltd.

Mr. Richard Kirchner, M.I.Mech.E., M.I.Prod.E., a vice-president and founder member of the Gauge and Tool Makers' Association, died suddenly on 1st April while holidaying on his yacht at Fareham Creek, Hants. Mr. Kirchner, who was 52, was deputy chairman and joint managing director of Arnott & Harrison, Ltd., Willesden, and a director of Crawford Collets, Ltd., and Omes, Ltd.

Capt. A. E. Penn, joint hon. secretary of the Institution of Engineers-in-Charge, died on 1st April at the age of 93.

Mr. F. G. Williams.—The death occurred on 9th April at his home at Fleet, Hants, of Mr. Richard George Williams, A.M.I.Mech.E., A.M.I.E.E.

Mr. Arthur Arnold, A.M.I.E.E., A.M.I.Mech.E., F.Inst.F., editor of Power and Works Engineering, died suddenly at his home at Garston, Watford, on 6th April.

INDUSTRIAL NEWS

State Industries' Finances

A WHITE PAPER outlining the Government's new thinking on the financial and economic obligations of the nationalised industries was published on Tuesday. (H.M. Stationery Office, price 1s.) In the Government's view there would be no advantage in altering the financial and economic principles which the nationalised undertakings are by their statutes required to observe. But "if these principles are to provide a satisfactory basis for their operation in the public interest they need to be interpreted more precisely in the form of financial objectives for the nationalised undertakings generally."

Tables are provided to show the relatively low return on capital employed by the nationalised industries compared with the average of 15 per cent earned by private industry. (In 1959 the Electricity Council's net income as a proportion of its net assets was 5-6 per cent, that of the South of Scotland Electricity Board 4-4 per cent and of the North of Scotland Hydro-Electric Board 3-9 per cent.) It is agreed, however, that the nationalised industries cannot be judged only by their commercial results.

The principal proposals are that nationalised industries shall balance their accounts within a five-year period and shall provide sufficient reserves from revenue to meet the excess of replacement cost over the "historic"

MORGAN CRUCIBLE GROUP

As foreshadowed in last summer's announcement by the chairman, Mr. Allen L. Stock, the Morgan Crucible Co., Ltd., has ceased to trade and has become a holding company and there are now five new wholly owned subsidiaries:-Morganite Carbon, Ltd., Battersea, S.W.11 (electrical and mechanical carbon products and sintered bearings), managing director: Mr. C. S. Harris; Morganite Crucible, Ltd., Norton, Worcs. (crucibles, furnaces and foundry accessories), managing director: Mr. D. S. S. Thynne; Morganite Electroheat, Ltd., Wandsworth, S.W.18 (furnace elements), managing director: Mr. I. Weston Morganite Research & Smith; Development, Ltd., Battersea, S.W.II, managing director: Mr. J. Walker; and Morganite Exports, Ltd., Battersea, S.W.11, managing director: Mr. J. H. Baumann. Messrs. Harris, Weston Smith and Walker are directors of the holding company.

method of depreciation and also to provide a contribution towards capital expenditure and contingencies.

Views are expressed upon the control of capital expenditure, costs, and price policy.

E.D.A. Luncheon and Meeting

The principal guest and speaker at the annual luncheon of the Electrical Development Association (on 9th May at the Savoy Hotel, London) will be Mr. Alfred Robens, chairman of the National Coal Board. The luncheon will be followed by the annual general meeting of the Association.

230 kV CABLE FOR TORONTO

THE largest oil-filled cable yet made by British Insulated Callender's Cables, Ltd., for commercial operation has been manufactured to the order of the Hydro-Electric Power Commission of Ontario. It is a single-core 230 kV cable and the 2·16 sq in conductor consists of six stranded segments laid round a central oil duct.

The cable has a reinforced lead alloy sheath and corrosion protection of self-vulcanising rubber, p.v.c. and hessian tapes. Reinforcing bronze tapes, tinned to prevent galvanic action between the bronze and the lead alloy, are applied over the lead alloy sheath.

The new cable will provide two three-phase circuits between Haig Junction and Applewood Junction in Toronto, each circuit being designed for operation at 230 kV with a rating of 540 MVA at 100 per cent daily load factor and 680 MVA at 75 per cent daily load factor with the adjacent circuit out of service.

Laying of the cables will be direct in the ground without ducts and, in anticipation of possible future load growth and an increase in the current carrying requirements of the cable

Cotton Mill Equipment for the Philippines

The complete electrical equipment required for a new cotton mill in the Philippines is being supplied by Associated Electrical Industries, Ltd. One order, valued at approximately £70,000, includes automatic power factor correction control equipment and capacitors, switchgear, transformers, fluorescent lighting, control gear, cabling, electrical and mechanical spares and a 600 kVA a.c. generator for use with a Ruston-Paxman diesel engine.

Platt Bros. (Sales), Ltd., who were the principals in negotiating the order for this new mill, are supplying the preparation and spinning machinery, and A.E.I. will provide starters and electric motors for the cards and drawing frames. circuits, three ³/₄in internal diameter polyethylene water pipes will be installed with each circuit for cooling purposes.

Installation work will be carried out under the supervision of the Phillips Electrical Construction Co., Ltd., a member of the B.I.C.C. Group.

Large Boilers for South Africa

Through their associates, Mitchell Engineering Proprietary, Ltd., of Johannesburg, Mitchell Engineering, Ltd., have been awarded a contract worth approximately £2\frac{1}{4} million by the Electricity Supply Commission of South Africa for the supply and erection of two boilers for Komati power station in the Eastern Transvaal. These boiler units will be the largest installed in the Union, and are due to be commissioned in 1964. Arrangements are being made for some 80 per cent of the plant to be manufactured in South Africa. Mitchells have already installed two 100 MW boilers at this station.

As reported last week, Associated Electrical Industries, Ltd., is to supply two 125 MW turbo-generator sets, condensers and feed heating plant for the station.

PROJECTED FAFNIR BEARING FACTORY

A contract to build a new factory, on a 20-acre site at Hednesford, Staffs., has been approved in principle between Mr. S. M. Cooper, chairman and managing director of the Fafnir Bearing Co., Ltd., and Mr. H. S. Booth, managing director of Shepley Booth & Associates, Ltd., civil engineers and building specialists, Wolverhampton.

Fafnir is an American controlled company which already has two main manufacturing plants in this country, at Hednesford and Wolverhampton. The parent company in New Britain, Connecticut, are the largest independent ball bearing manufacturers in the United States.

New G.P.O. Building

THE largest building to be erected for the Post Office since the war, the Fleet Building in Farringdon Street, London, was officially opened by the Lord Mayor last Tuesday. As mentioned in our 16th December, 1960, issue, it will house the automatic telex switching exchange and will eventually accommodate two telephone exchanges. The estimated cost including lighting and oil-fired heating equipment and lifts but excluding Post Office apparatus is £1.88 million.

London's new telecommunications centre includes a 165ft high 12-storey tower block with three basement floors. The installed electrical load is 3 MW and the maximum demand will be about 1.9 MW. The 3,700 lighting points and 1,300 socket outlets in the building have cost an average of £14 per point. This figure includes the cost of lighting fittings, ducting and trunking and the separate conduit system for the emergency lighting.

The building was designed and the erection was supervised by the Ministry of Works. Tersons, Ltd., were the main contractors, and the electrical installation was carried out by the London Electricity Board.



The new Fleet Building, which houses the automatic telex exchange

Technical Writing Awards

THE winners of the 25-guinea premiums awarded by the radio and electronics industry for six technical articles published in 1960 are announced by the Electronic Engineering Association and the Radio Industry Council, the sponsors of the scheme. Sir Harold Bishop, director of engineering, B.B.C., will present the awards at a special luncheon at the Café Royal, London, on 25th April.

The 1960 prize-winners—not in order of merit-are:-Mr. A. E. Crawford, Messrs. G. L. Grisdale, B.Sc., Ph.D., and D. A. Paynter, A.M.I.E.E., Mr. D. L. Swale, Mr. C. M. Cade, Messrs. E. N. Rowlands and H. S. Wolff, and Messrs. P. L. Owen, M. F. Partridge, M.A., and T. R. H. Sizer, A.M.I.E.E.

Under the chairmanship of Mr. H. E. F. Taylor, who succeeded the late Air Marshal Sir Raymund G. Hart, the panel of judges comprised Professor H. E. M. Barlow, Mr. B. C. Brookes, Mr. A. H. Cooper, Mr. F. Jeffrey, Mr. G. Reeves and Dr. R. C. G. Williams.

The awards scheme is likely to be extended and revised for 1961.

Sharing Scientific Equipment

A SCHEME for sharing scientific, equipment—one of items they are equipment between industrial companies in South-East England has recently been announced by the London and South Eastern Region of the Federation of British Industries. A large proportion of the 126 industrial firms represented in the Region's Research Directors' Discussion Group have submitted two lists of items of

prepared to make available to other companies; the other of equipment to which they would like to have access. These lists are now being circulated to all members of the Group with the suggestion that "offerers" "seekers" should get in direct contact. It is hoped that other companies will be moved to participate as a result of this initial circularisation. The idea arose from a suggestion made by a member of the Group.

A.E.I. and G.E.C. to Form Joint Metals Company

Following the announcement on 9th December by the A.E.I. Lamp & Lighting Co., Ltd., and the General Electric Co., Ltd., of the formation of a joint company for the manufacture and sale of glass products, the two companies have now agreed to form a similar company for the manufacture and sale of molybdenum, tungsten and other metal products associated with the electric lamp and radio valve industries. The new company is expected to commence trading as a separate organisation within a few months. Its headquarters will be at Morth Wembley.

A.S.E.E. YEAR BOOK

Apart from the necessary bringing up to date, the tenth edition (1960-61) of the Year Book of the Association of Supervising Electrical Engineers includes a good deal of new technical material. The principal items among this are choosing metal rectifiers; electric motor control gear for applications imposing fire hazards; oil-burner controls; and the installation of communal television aerial systems.

Copies are available from the Association, 23, Bloomsbury Square, London, W.C.1, at 5s including postage.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical

ALUMINIUM ingots ton £186 os of COPPER, H.C. Electro ton £229 108 of	
COPPER, H.C. Electro ton £229 108 (
	361
Fire Refined 99.70% ton $f_{1,228}$ os of	
COPPER Tubes Ib 2s 2½d	
Sheet ton £263 os o	
H.C. wire and strip ton £280 58 0	od
LEAD, English ton £67 58 0	bc
Foreign ton £66 os	
MERCURY flask £,68 os	
TIN, block (English). ton £839 10s	
	Ju
BRASS Tubes (solid	
drawn) lb is iod	
Wire lb 2s 8½d	
PHOSPHOR BRONZE	
Wire lb 4s 1\frac{1}{4}d	
PLATINUM oz f.30 ios o	nd
RUBBER, No. 1 R.S.S.	-
spot lb 26d—26\frac{1}{4}d	

industry. The figures given are the selling prices and are those quoted on Tuesday last.

Winding Engines for Northern Rhodesia

THE Fraser & Chalmers Engineering Works of the General Electric Co., Ltd., has received an order worth over £150,000 from the Anglo-American Corporation of South Africa, Ltd., for two complete double-drum winding engines. They are for the main subincline shaft of Bancroft Mines, Ltd., Northern Rhodesia, and will be installed in an underground chamber approximately 1,150ft below the surface. One of the winding engines will be employed for handling rock and the other will be used for winding men and materials.

The mechanical parts of the winders will be identical and will be designed

and manufactured at the company's Erith Works. Each drum will be 11ft in diameter and 4ft wide, and the engines will be fitted with G.E.C.'s low-pressure oil-operated brakes. They will be driven through single-reduction

gears by 11 kV three-phase 1,440 h.p. 570 r.p.m. motors.

Design and manufacture of the electrical equipment is to be carried out at the company's Witton works. Both winders will be fitted with the G.E.C. patented form of a.c. closed-loop speed control. For the rock winder the controls will allow semi-automatic operation and on the other winder provision will be made for the fitting of semi-automatic controls at a later date.

Commercial Travellers' Schools Appeal

THE first major appeal to the electrical industry on behalf of the Royal Commercial Travellers' Schools for over ten years is to be made by Mr. Arthur T. Haywood, joint managing director, Electrical Components (Holdings), Ltd., who is the President of

only written instructions were on the

switchgear itself. Mr. A. Richards, a

third assistant district engineer, stated that the damaged switch was later found to be in the "off" position.

Two padlocks, normally used for lock-

ing safety devices, were on the frame

ment of Electrical Engineering, Leeds

University, said that if the operator

had switched from the "off" position

to "earth" instead of to "on," that

was a human error. The force of

explosion could have thrown the switch

back to the "off" position. He added that when he first saw the switchgear

he did not find the instructions com-

Dr. B. F. Salvage, of the Depart-

at the side of the switch.

pletely clear.

Appeal for the year 1961-62. The last time the President of Appeal was a member of the electrical industry was in 1949, when Sir Leslie Gamage held the office.

At a recent Press conference Mr. Haywood said that the cost of running the Schools now exceeded £70,000 a year. Over 75 per cent of this had to be raised from voluntary donations as the Schools get no State aid. Investments had been reduced by 50 per cent to provide £.130,000 for essential rebuilding between 1951 and 1955. Mr. Haywood said his aim was to raise between £50,000 and £60,000 during his period of office so that the annual deficit was turned into a substantial surplus. This would allow improvements to be made progressively without dipping into capital resources. Though the schools were well supported by commercial travellers the appeal would only succeed if there was additional support from industrial and other concerns.

The annual festival dinner of the Schools was held at the Savoy Hotel, London, last Friday. It was the first time that the function had been staged at the Savoy and a record number of 550 guests were received by Mr. T. A. H. Sycamore, C.B.E., and Mrs. Sycamore.

Keighley Inquest

AT the resumed inquest at Keighley on Mr. John Thwaite, aged 56, second assistant district engineer, and Mr. Alec Clarkson, aged 40, charge-hand jointer, who were killed in an explosion at the Sawmills substation of the Yorkshire Electricity Board in Lawkholme Lane, Keighley, on 6th March, the jury expressed the view that fuller operating instructions for switchgear should be made available at substations and suggested that senior workers-the only people allowed to operate the switchgear-should be made familiar with all types of switchgear. Verdicts of "Death by mis-

adventure" were recorded.

Sections of the switchgear were demonstrated at the inquest, and Mr. J. H. Hooper, district engineer for the Y.E.B. at Keighley, said he was satisfied that the only reason for the explosion was the inexpert or improper operation of the switchgear apparatus by Mr. Thwaite. He did not think that Mr. Thwaite, who to his knowledge had not worked this particular switchgear before, had been given any specific operating instructions. The

Nuclear Power Station Inquiry

The public inquiry into the proposal of the Central Electricity Generating Board to build a nuclear power station at Wylfa in Anglesey will open at the Memorial Hall, Amlwch, on Tuesday, 30th May, at 10.30 a.m.

The inquiry will also deal with the Board's proposals for a 400 kV double circuit overhead line from the proposed station across Anglesey and the Menai Straits to a new substation at Pentir, near Bangor.

The Minister of Power has appointed Mr. H. W. Grimmitt, C.B.E., M.I.E.E., M.I.Mech.E., Chief Engineering Inspector of the Ministry of Power, and Mr. E. Farricker, Principal Inspector of the Ministry of Housing and Local Government, to hold the inquiry.

ENGLISH ELECTRIC SCHOLARSHIP AWARDS

In announcing the 1961 awards of their university scholarships and exhibitions, the English Electric Co., Ltd., say that the Selection Board reported that the level of examination results achieved by candidates was very high. This is the fourth group of graduates to be awarded these scholarships since they were founded in 1957. The awards consist of fifteen scholarships worth £450 a year and tenable for three years at a university in the United Kingdom, and five exhibitions of up to £200.

L.S.E. to Supply Nuclear Submarine Equipment

An order has been placed with Laurence, Scott & Electromotors, Ltd., for the design and manufacture of the electrical propulsion machines and control gear for the second British nuclear submarine, being built by Vickers Armstrongs (Shipbuilders), Ltd.



in new Birmingham flats

Latest installation of MEM control units for underfloor heating, is in multi-storey flats at the Lyndhurst Estate, off Chester Road, Birmingham. Two types of unit are fitted:

- (a) Consumer control unit for day and night off-peak loads. Switches are included for general lighting and power, floor heating and also water heating.
- (b) Group controller for off-peak floor warming and water heating supply to 4 flats using type (a) units.

Basic requirement of such controls is a main switch, a contactor which can be time controlled, and distribution fuses. MEM control adapts readily to the varying forms of distribution favoured by different authorities. MEM will be happy to assist in any problems relating to underfloor heating control. Very competitive prices can be quoted.

underfloor heating control by

Architect: City Architect, Birmingham A. G. Sheppard Fidler, M.A.,B. Arch., F.R.I.B.A., A.M.T.P.I. Electrical Contractor: Etna Lighting and Heating Company Limited. General Contractor: Messrs. George Wimpey and Company Limited.



MIDLAND ELECTRIC MANUFACTURING CO., LTD.

Reddings Lane, Tyseley, Birmingham, 11











15, 30 or 60 amp. 440 volt a.c. Single Pole and Neutral, Double Pole, Triple Pole, Triple Pole and Neutral Switchfuses with interchangeable H.R.C. or rewirable fuses.

9.6.C.

INSTALLATION EQUIPMENT GROUP SWITCH AND FUSE GEAR · H.R.C. FUSES · OVERHEAD BUSBARS · RISING MAINS · CONDUIT · PIRELLI GENERAL CABLE · CABLE TRUNKING UNDER FLOOR CABLE DUCTS · ELECTRIC WIRING ACCESSORIES · BELLS

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INSTALLATION EQUIPMENT GROUP HEADQUARTERS, FOUR ASHES, WOLVERHAMPTON

INDUSTRIAL NEWS [continued

Core Balance Protection

IN an article entitled "Regulation 507" by Mr. J. de Gruchy in our 14th October issue, reference was made in the second paragraph to a core balance system for phase-to-earth faults in the larger domestic and industrial installations. A prototype of such a unit was demonstrated by the Clare Instrument Co. at the Electrical Engineers Exhibition held recently at Earls Court. The 25 A pattern shown was made to trip the circuit with less than I A of leakage current.

Regulation 410 of the I.E.E. Wiring Regulations requires that a differential earth-leakage circuit-breaker of the current-balance type shall be arranged to operate when the leakage current to earth attains not more than 15 per cent of rated current for the circuit, or 5 A, whichever is the greater. This implies that for 30 A domestic installation the permitted earth resistance is 8 ohms for a rise of 40 V. The new core balance unit operating at I A provides for a maximum of a 40 ohm earth resistance. The core balance unit thus provides a higher sensitivity which is limited mainly by the nuisance value of promiscuous tripping. A further advantage is that the core balance unit does not require the use

ELECTRICAL TRADES DIRECTORY

Details of 5,500 electrical manufacturers and companies, some 3,500 electrical installation contractors and over 800 electrical and radio wholesalers are contained in the 1961 "Electrical Trades Directory"—the Electrical Journal "Blue Book"—which is now available from Benn Brothers, Ltd., Bouverie House, 154, Fleet Street, London, E.C.4 (price 70s including carriage).

The directory, which is made up of eleven sections, covers all branches of the electrical industry and the main products of the electrical, electronics and allied industries listed number some 2,700. There is an increase in the number of headings in the electronics section, first introduced in the last edition, and reference is also made to over 7,000 patented and registered trade names.

The increase in the number of entries over the past few years has resulted in a change in format in this current edition, in order to make the book more easy to handle. The page width has been increased to contain three columns and the page depth to $9\frac{1}{2}$ in, providing an average of 50 more entries per page.

of an auxiliary earth as is the case with earth-leakage circuit-breakers.

Prototype units of the new core balance design are to be tested in difficult earth areas during the coming summer to prove the suitability of the design before large-scale production is planned.

E.D.A. Assistant Director

In this issue the Electrical Development Association is advertising for an assistant director at a minimum salary of £3,500 a year. Candidates are expected to have had extensive experience in responsible positions in the electrical industry, ability in the field of public relations and "initiative, enthusiasm and imagination," as well as the other qualities for which the position calls.

Bruce Peebles-REGA Brucker Agreement

AN agreement has been concluded between Bruce Peebles & Co., Ltd., of Edinburgh, and REGA Brucker & Co., of Siegburg, Germany, for the joint production and marketing of complete electrical equipments for the operation and control of ferrous and non-ferrous hot and cold rolling mills. Under the agreement, which covers the supply of equipment in the whole of the United Kingdom and Eire, rotating machines and rectifiers will be built by Bruce Peebles and the electronic controls, programming, optimisation and automatic gauge control equipment will be designed by REGA Brucker and manufactured either by

Flat Pressure Cable Contracts

Following a successful field installation at Southend-on-Sea, Enfield-Standard Power Cables, Ltd., has been awarded two contracts by the Eastern Electricity Board for over six miles of 33 kV flat oil-filled pressure cable. These contracts, valued at £150,000, also include 33 kV solid type cable and associated auxiliary cables.

them, or, under licence, by Bruce Peebles. Among the activities already in progress are contracts entailing full responsibility for the electrical equipment for several rolling mills.

New Perthshire Hydro-electric Station

The North of Scotland Hydro-Electric Board has brought into operation the Lednock power station in Perthshire. This completes the Breaclaich works. The power station, 1,160ft above sea level, is one of the highest in Scotland. It stands on the shore of Loch Lednock, the reservoir formed in Glen Lednock by a dam about five miles up the glen from Comrie village. It has a capacity of 3 MW and an estimated average annual output of 5 million kWh.

The horizontal Francis turbine in the power station, which operates under a gross head of 300ft, was manufactured by the Harland Engineering Co., Ltd. It drives an induction generator supplied by Bruce Peebles & Co., Ltd.

G.E.C. 8,000 H.P. Motor

Nearly 1,200 copper segments, weighing 2,400 lb, are being assembled at the G.E.C. Witton Works for this 94½ in diameter commutator. It is part of an 8,000 h.p. 142 r.p.m. double-armature d.c. motor, one of six machines which will be used to drive the finishing train of the 68 in hot strip mill under construction at the new Spencer Works of Richard Thomas & Baldwins, Ltd. These motors form part of a £2½ million order now being carried out by the company



INDUSTRIAL NEWS [continued

LARGE ROLLING MILL ORDER

THE English Steel Corporation, Ltd., has placed an order worth nearly f.1 million with the Heavy Plant Division of Associated Electrical Industries, Ltd., for equipment for four rolling mills which are to be installed at the Corporation's new Tinsley Park Works, Sheffield. The equipment will include two 3,500 h.p. d.c. motors for the twin drive of a 42in blooming and slabbing mill which will be supplied by the Davy & United Engineering Co., Ltd., and the Brightside Foundry & Engineering Co., Ltd., acting as a consortium. The two motors are to be installed with the upper motor nearer the mill than the other-this is the "top-forward" arrangement which was pioneered in the United Kingdom by A.E.I.

Two 32in billet mills which will also be supplied by the consortium will be equipped with A.E.I. motors—one of 4,000 h.p. and the other of 5,000 h.p. The bar mills, for which the complete order has gone to the Brightside Foundry & Engineering Co., Ltd., will consist of a reversing roughing mill driven by a 2,000 h.p. motor; an intermediate mill driven by a 1,000 h.p. motor; and a continuous mill driven by five 450 h.p. motors and two 350 h.p. motors.

As well as the main motors, A.E.I.

will supply and install steel-tank mercury-arc convertors to provide power for the d.c. motors; motor and rectifier ventilation equipment; all the d.c. circuit-breakers; open-type motor control panel; motor supervisory cubicles; electronic controls; and magnetic amplifiers.

Electrical Development at

The electrical load in the Cumbernauld area is likely to increase five-fold in the next six years as a result of building development by the Cumbernauld Development Corporation and to meet this demand the South of Scotland Electricity Board is to reinforce the supply to the town by extending the 33 kV Bonnybridge-Greenhill overhead lines to a new 33/11 kV substation to be established in the town of Kildrum. Work on the scheme, which will cost £118,000, will be completed during 1962.

Of the 20,000 houses to be built by the Corporation, about half will have underfloor electric heating. By 1966 it is estimated that the electrical load in schools in the town will have increased to 6,000 kW and the industrial load to 13,000 kW.

Electricity and Clean Air

THE Clean Air Act will have a tremendous impact on electricity supply, said Mr. William Hutton, deputy chairman of the South of Scotland Electricity Board, when he spoke in Glasgow on 30th March at a meeting of the Electricity Consultative Council. Although there were as yet few smokeless zones in the Board's area, he said, experience from these had shown that the industry would get more business from them than all the other fuel industries put together. The business possibilities were enormous.

Power could be made available at a lower tariff if supplies were taken

Television Set Price Reductions

Substantial reductions in the retail prices of 17in and 21in domestic television receivers are announced by the Radio Group of the General Electric Co., Ltd. A typical example is the BT318 17in table model, the price of which is reduced from 63 to 49 gns.

at off-peak periods. Unfortunately, because of purchase tax regulations, manufacturers of storage heating appliances, who were able to produce domestic models, would not do so. The use of these storage heaters in domestic premises was thus prevented, said Mr. Hutton, "because of a wretched ruling by the Customs and Excise." The Government was pressing for the atmosphere to be cleared; yet through "this small matter of purchase tax" it was making it difficult for the electricity authorities to help the housewife.

The Board, Mr. Hutton said, expected to finish the present year with a modest surplus, and to get through 1962 at least on level terms. There was thus no need to disturb tariffs this year or next. In 1963, however, when new stations would be operating, the Board intended to have another look at the whole tariff structure. The off-peak tariff might then be further reduced.

Borough Polytechnic Courses

A short course of evening lectures in electrical installation design is being held at the Borough Polytechnic, London, S.E.1, next term. This course was initiated at the request of the Electrical Contractors' Association, and the syllabus arranged in conjunction with them. The lectures will cover the basis of installation design, protection of electrical installations, design of lighting, heating and motor installations, and electrical installations in houses, flats, offices and factories. In addition, there will be an optional course to conduct design projects. Holders of the O.N.C. or a City and Guilds Certificate will be preferred, but applications will be considered from anyone with a reasonable technical knowledge.

The lecture course will be on eight Wednesday evenings, commencing 19th April (fee £1) and the project course on six Friday evenings, commencing 5th May (fee £1).

The Division of Liberal Studies is offering a short course of six evening lectures on "Some Problems of Technical Writing," commencing on Wednesday, 26th April (course fee £1).

TRADE ANNOUNCEMENTS

The Plessey Co., Ltd., announces that a licence agreement has been concluded with Rini International whereby Plessey will manufacture Rini thermal overload protectors and starting relays, with exclusive marketing rights in the United Kingdom and non-exclusive rights elsewhere, except Italy.

The Birmingham sales office of Thomas Bolton & Sons, Ltd., has been transferred to 7, Market Street, Lichfield, Staffs. (telephone: Lichfield 3632). This office will now serve the north and south Midlands areas, and the following sales representatives are situated there:—Mr. F. W. Wooliscroft, Mr. C. R. H. Johnson and Mr. J. Middleton.

The Birmingham offices of the British Driver-Harris Co., Ltd., have been moved to Target Works, Hancock Road (telephone: East 3761).

J. Langham Thompson, Ltd., announce that they have entered into a licensing agreement to manufacture a range of "dimensionless" strain gauge type transducers designed by Statham Instrument, Inc., Los Angeles, California.

The telephone number of **Hardman** & Co., Ltd., has been changed to Rochdale 47411.

The New Lighting Code

RECOMMENDATIONS ON ILLUMINATION LEVELS AND GLARE

HE fifth edition* of the "I.E.S. Code for Good Interior Lighting" was published last Tuesday by the Illuminating Engineering Society. This new edition amounts to a complete revision of the Code and lays great stress on the quality of light while paying full attention to levels of illumination. The significance of the new code is discussed in our leading article in this issue.

The Code pays particular attention to the following three considerations involved in good lighting design: (1) The computation and control of direct discomfort glare from artificial light sources; (2) the basis for determining illumination levels; and (3) daylight design. For the first time, tables have been developed giving limiting glare values for different occupations and situations and a simple tabular method of assessing actual glare is included.

The first part of the Code discusses the principles of good lighting. The brightness and colour patterns within both the working areas and the surroundings have to be carefully planned so that attention is drawn naturally to the important areas, detail is seen quickly and accurately and the room is free from any sense of gloom or monotony.

The brightness pattern is generally composed of three main parts, the task itself, the immediate background and the general surroundings. Other factors to be taken into consideration are safety and amenity. In occupations where the visual demands are small, the levels of illumination derived from a criterion of visual performance alone may be too low to satisfy these other requirements. For such situations, therefore, illumination recommendations are based on standards of welfare, safety and amenity judged appropriate to the occupation. Unless there are special circumstances associated with the occupation, the Code recommends that the illumination of all working areas within a building should be not less than 15 lumens/ sa ft, even though the visual demands of the occupation might be satisfied by lower values.

When the task brightness has been decided, the brightness of other areas can be related to it so that the desired overall effect is obtained. Recommendations for relating the average brightness of both the immediate background and the general surroundings to that of the task itself are given in a table. For a high task brightness, the background brightness should be 30 per cent that of the recommended value for the task and 10 per cent for the surroundings.

Excessive Glare

S.W.1, price 12s 6d.

One of the most important requirements of good lightwhich the brightness and area of the sources, their position and the average brightness of the room background are the most important. In the Code, glare discomfort is

ing is that installations should be free from excessive glare. The degree of glare resulting from direct view of the light sources in an interior depends on a number of factors of

* The Illuminating Engineering Society, 32, Victoria Street, London,

expressed in terms of a glare index, which can be computed from a basic formula given in the Code. Although basic calculations are necessary in some circumstances, the procedure is very tedious. However, for artificial lighting installations where the fittings are mounted symmetrically overhead, the glare index can be derived from tabulated data, which cover a large number of types of fittings, room sizes and room reflection factors.

Acceptable freedom from glare discomfort is achieved by ensuring that the computed glare index does not exceed the value recommended for the particular situation. The Code gives some advice on the control of reflected glare, from polished desk tops, etc.

In a section on colour rendering, the Code states that the level of illumination for all critical colour work should be high and a value of not less than 45 lumens/sq ft is recommended. Part I of the new Code concludes with an extensive section on the maintenance of lighting installations which includes recommendations for maintenance factors.

Calculating Illumination Values

Part II of the Code details the basic aspects of illumination design, the control of glare and "daylighting" design. The method of assessing illumination required for particular applications for which there are no authoritative recommendations has been altered. In the previous Code, the method depended on a drawing relating apparent size of detail, and contrast between the object and its immediate background, to give a value for the required illumination. In the new Code, the required illumination can be calculated by a formula or read off a nomogram based on the formula. The formula requires a knowledge of two factors only, the apparent size of the object and the highest reflection factor in the detail of the task. In the formula, the apparent size of the object is given in minutes of arc subtended at the eye when the task is viewed from the normal viewing distance. This figure can easily be calculated as shown in the Code.

As already mentioned, direct glare can be readily assessed by using tables given in Part II of the Code. The third section in Part II concerns permanent artificial lighting or "daylighting." The higher levels of illumination recommended in the new Code recognise that in deep offices and similar buildings (that is where the wall is probably more than 13 to 15ft away from the window and especially in rooms with modern low ceilings), it is almost impossible to obtain the required levels of illumination in the far areas of the room. The impossibility of providing the necessary daylight factor is now accepted and the Code suggests that functional lighting should be supplemented by properly designed artificial lighting. A table giving recommended values of minimum daylight factors is given in the Code and the level of permanent supplementary illumination can be calculated from a formula. This new approach to daylighting may have an

TABLE 1.—RECOMMENDED VALUES OF ILLUMINATION AND GLARE INDEX

	New Co	Previous Edition		
	Recommended Illumination (Lumens/sq ft)	Limiting Glare Index	Recommended Illumination (Lumens/sq ft)	
OFFICES. Entrance halls and reception areas Conference	. 15		7	
rooms, execu- tive offices General offices	30 30	19 19	20	
Drawing offices (a) General	30	16	15	
(b) Boards and tracing	45	- 16	30	

effect on both building design and on the contribution which electric lighting will make to good lighting.

Schedules of recommended values of illumination and limiting values of glare index are given in Part III of the new Code. Table 1 is a short extract from these schedules, which have been considerably enlarged since the last edition. From this, it can be seen that the new Code proposes higher values of illumination than those quoted

in the previous fourth edition. A typical increase is the figure for general offices, from 20 to 30 lumens/sq ft. Table 1 also shows that the percentage difference between general and individual lighting in drawing offices is not as great under the new Code as in the previous Code. The contrast has been reduced, but the overall level increased.

The method of classification of types of fittings has now become more complex due to the addition of the glare index. These are now defined in a separate report to be published at the end of May, the "British Zonal Method for Coefficients of Utilisation." Apart from this factor, the new Code does not mean any alteration to the conventional method of designing for illumination levels. However, these designs must now be checked for discomfort glare.

The new Code was presented at a meeting of the Illuminating Engineering Society in London last Tuesday and a lecture entitled "The New I.E.S. Lighting Code" was given by Dr. W. E. Harper. At the same meeting a certificate of honorary fellowship was presented to H.R.H. the Duke of Edinburgh.

ENGINEERING IN EUROPE

TO determine the possibility of improving the utilisation of a transformer winding, the heat exchange characteristics of transformers were determined in air and oil. When the local heat transfer conditions were determined, the arrangement chosen eliminated the heat exchange between adjacent winding elements. The measurements in air showed that a gradual variation of the sections of the conductors of the coils corresponding to the local cooling conditions enabled the total copper weight of the winding to be reduced by 18 per cent without endangering the winding thermally. In tubular windings this percentage applies only to the external winding, but in disc-wound transformers and reactors it applies to the full copper weight used.

If the winding comprises three different types of coils of different conductor sections, the total weight of copper may be reduced by about 15 per cent. Such a coarsely stepped winding is cheaper to produce than one with finer steps. If the external winding is produced with finer steps, up to 29 per cent weight of copper may be saved compared with windings of uniform section, and measurements show that the temperature rise will be increased by only 4°C at the hot spot (whereas calculations for different percentage loss conditions indicate up to 19°C). Utilisation of the cooling oil is definitely improved and four steps in the winding sections were found to be sufficient (without considerable rise of production costs) to save about 24 per cent of copper against a uniform winding. In such a winding design the conductor section of the first coil may be reduced to one-eighth of the design section without the permissible maximum temperature being exceeded.—" Contribution to a Copper-Saving Design of Air- and Oil-Cooled Transformers by Stepping the Conductor Sections of the External Windings," by T. Boduroglu, *ETZ-A*, Vol. 82, No. 3, pp. 68-75, 30th January, 1961, in German.

Overhead Line Design Voltages

Problems in the use of steel-cored aluminium conductors on h.v. and v.h.v. lines are concerned with the erection, and the safety and economy of the operation of these lines. The subject is being widely discussed at present, especially in international organisations such as C.I.G.R.E., and many articles are devoted to it in the journals of the leading industrial nations. However, this also indicates that there are still various allied problems on which opinions do not agree, owing to differences in the operational experience available in various countries and with different voltage ranges and conductor types.

The author considers the main publications and C.I.G.R.E. reports very carefully and discusses the interrelations between mechanical strength values and safety factors, thermal stressing and the principles on which the design voltages are determined. Of particular interest is the operational experience obtained on the 400 kV transmission line in the U.S.S.R. during four years' operation. This showed, above all, that steel-aluminium conductors are very rarely burnt through, by comparison with copper, even by very large short-circuit currents. If the coordination of the safety factors of conductors and supports is incorrect, even steel towers are destroyed more easily than steel-aluminium conductors. It is stated that this type of conductor is highly vibration-resistant and in some cases is quite safe without vibration dampers .-- "The Problem of the Design Voltages of Steel-Cored Aluminium Overhead Line Conductors," by O. G. Vekselman, Elektrichestvo, No. 1, pp. 9-15, 1961, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, Electrical Review.



S.S. "EMPRESS OF CANADA"

HE new Canadian Pacific liner, the 27,300 ton Empress of Canada, will sail from Liverpool on 24th April on her maiden voyage to Quebec and Montreal. Launched at the Walker-on-Tyne yard of Vickers-Armstrongs (Shipbuilders), Ltd., on 10th May last year, the ship has been designed for the North Atlantic service during the St. Lawrence season from April to November, and for winter cruising. A total of 1,048 passengers can be accommodated in addition to 3,600 tons of cargo, and there are 510 crew. The overall length is 650ft and the main propulsion machinery—consisting of two Pametrada designed turbines working on a reheat cycle and totalling 27,000 s.h.p.

supplied with steam from two controlled superheat and one reheat Foster Wheeler boilers each having a working pressure of 650 p.s.i.g. and steam temperature of 850°F at the superheater outlet—gives an average speed of 20 knots.

Electricity for auxiliary power, lighting and other services is supplied by two 1,500 kW self-contained d.c. turbo-generators and three 500 kW two-stroke dieseldriven generators, all constructed by W. H. Allen, Sons & Co., Ltd. These feed the main switchboard in parallel. Two 100 kW, 225 V National Gas & Oil Engines Co., Ltd., diesel generators provide emergency power, while a further

emergency source is a Nife battery capable of operating all watertight door motors and supplying emergency lighting for about one hour.

Each of the turbo sets has a normal full-load output of 1,500 kW with an overload capacity of 25 per cent for two hours. The turbines, which are designed for a steam pressure of 600 p.s.i.g. (boiler pressure 680 p.s.i.g.) and a total temperature of 850°F (boiler 850°F) drive the d.c. generators through Allen Stoeckicht doublehelical, planetary epicyclic type reduction gearing with a ratio of 11.36:1, the turbines running at 6,250 r.p.m., and the generators at 550 r.p.m. Each turbine is mounted on its own selfcontained surface condenser, designed to give a vacuum at full load of 28½in Hg (barometer 30in) when supplied with cooling sea water at 75°F. The condensate extraction pump for each



One of the two Allen 1,500 kW turbo-generators

turbo-set is driven by an 8 h.p. vertical-spindle enclosed, ventilated, drip-proof motor.

The d.c. generators are 225 V machines of the forcedlubricated single pedestal-bearing, compound-wound type, with drip-proof canopy protection over the commutator. The cooling air is drawn in at the driving end and ejected at the commutator end through trunking at the top of the machine. Each machine is provided with back-of-board mounting hand-operated shunt-field regulator and electrical overspeed trip, working with the turbine trip gear.

The diesel engine generating sets each consist of a six-cylinder, 755 b.h.p., two-stroke engine (built under licence from Harland & Wolff, Ltd.) directly coupled to a 500 kW, 225 V d.c. generator running at 350 r.p.m. The generators are continuously rated and suitable for operating in parallel, both with one another and with the turbo-sets. Each generator is supplied with a back-of-board mounting hand-operated shunt-field regulator.

Two 20/18in auxiliary salt-water circulating pumps are installed for the turbo-generator sets, each being driven by a 53 h.p. vertical-spindle d.c. motor having a speed range of 425/575 r.p.m. Each pump is capable of delivering 5,500 gal of salt water per minute against a total head of 25ft at the normal speed of 560 r.p.m. Other Allen electrical equipment includes two 28 h.p., 500 r.p.m., one 15 h.p., 400 r.p.m., and one 5 h.p., 1,000 r.p.m. motors and starters for the operation of the Denny-Brown stabilisers.

Alternating current for auxiliary circuits is supplied by three Mawdsley motor alternator sets, each comprising a 145 h.p. 220 V d.c. motor driving a 120 kVA, 230/133 V, 50 c/s, 3-phase alternator with Class "B" insulation. The alternator is of the compensated type which does not require a voltage regulator, but maintains the output voltage within $\pm 2\frac{1}{2}$ per cent under all conditions of load and power factor. The alternator and motor are built as a single unit, the d.c. armature and alternator rotor laminations being assembled on one shaft, and the yoke and stator frames constituting a single casing.

Electrical distribution essentially consists of three ring main circuits, feeding the forward and after ends and the machinery space. The main d.c. switchboard suitable for controlling the generators and 20 outgoing feeder circuits was supplied by Whipp & Bourne, Ltd. The main board is of the open flat back type 7ft 5in high by 46ft 2in long. It is fitted with three 8,000 A and two 2,500 A normal speed triple pole generator circuit-breakers, and one 3,000 A, eleven 750 to 2,500 A and eight 500 A normal speed double pole tandem coupled feeder breakers. Mounted on a centre panel are the controls for ring main supplies to five auxiliary switchboards and preference trip relays, earth test equipment, etc. The main busbars are ten pieces of 5in by \$\frac{1}{4}\$in h.c. copper, provided with isolating links in the run of connections to enable the switchboard to be split and operated in independent halves.

An emergency switchboard for controlling the two 120 kVA 225 V generators, an a.c. switchboard for controlling the three motor alternators with switch and fuse circuits for fluorescent lighting and other a.c. supplies, and 17 auxiliary switchboards were also supplied by Whipp & Bourne.

Three d.c. switchboards have been provided by Brookhirst Igranic, Ltd., whose equipment controls 265 motors with a total of some 5,000 h.p.

Laurence, Scott & Electromotors, Ltd., have supplied 100 motors totalling over 4,000 h.p. for driving various auxiliaries, also eight 3-ton and two 5-ton winches of the Scott "Selector" type which incorporate electrical braking and automatic control of maximum speed governed by the weight of the load.

Other electrical equipment manufacturers include:—British Insulated Callender's Cables, Ltd., and Associated Electrical Industries, Ltd.—cables; G. P. Dennis, Ltd.—fuse boxes; General Electric Co., Ltd.—cold cathode lighting; Philips Electrical, Ltd.—hot cathode lighting; Crompton Parkinson, Ltd.—instruments; Otis, Ltd.—lifts; Henry Wilson & Co., Ltd.—galley equipment; Communication Systems, Ltd.—exchange telephones; Clifford & Snell, Ltd.—loudspeaking telephones; Marconi International Marine Communications, Ltd.—wireless telegraphy equipment; and Marconi, Ltd.—radar.

TWO MORE POWER STATION SITES

THE Central Electricity Generating Board announces that two of the sites investigated in the West Riding of Yorkshire have been found suitable for large coal-fired power stations. One of these is an extension of the Board's existing site at Ferrybridge, near Castleford, where two stations with an aggregate plant capacity of 470 MW are now in operation. The other is at Eggborough, about four miles to the east of Knottingley.

Both sites are on the east fringe of the Yorkshire coalfield, which is second only to the adjoining East Midland coalfield as a producer of coal for electricity generation. The Yorkshire coalfield possesses large reserves and the National Coal Board expect in the future to supply substantially increased quantities of the small coals that power stations can burn efficiently.

The Ferrybridge site already has a rail connection and, being on the navigable part of the River Aire, it can also receive coal in barges from those collieries accessible to water transport. The Eggborough site can be rail connected by a short spur off the Wakefield-Knottingley-Goole railway. Each of the sites is considered suitable for a station of about 2,000 MW capacity, burning some five million tons of coal a year. Both sites are on the River Aire, which is the only adequate source of cooling tower make-up water in this part of the coalfield.

Early construction of both stations is necessary to meet the rapidly increasing demand for electricity and the Board is applying to the Ministry of Power and the West Riding County Council for the necessary statutory consents.

A third site, on the River Aire at Gowdall, to the east of Eggborough, is believed to be potentially suitable for a station to meet later growth of demand, subject to further study of cooling water problems. Further investigations are also required into the problems of a station on the River Don, additional to the 1,100 MW Thorpe Marsh station now under construction.

Reactive Power

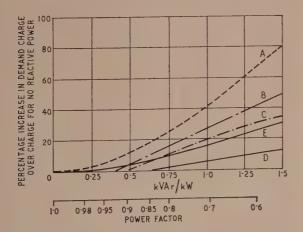
By W. CASSON, M.I.E.E.*

Summary of a paper by W. Casson, M.I.E.E., and H. J. Sheppard, B.Sc., M.I.E.E., entitled "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales." The paper was read before an ordinary meeting of the Institution of Electrical Engineers on 6th April

THE control of reactive power in a power supply system is to some extent more difficult than the control of active power. It may be said that reactive power is required for excitation purposes and is consumed in the series and shunt inductances of the system and load, and supplied by the generators, system capacitance and compensating devices such as shunt capacitors and synchronous machines. In the paper three problems in meeting the requirements for reactive power are considered: firstly, how it can be most effectively controlled; secondly, how much it costs to deliver it to the consumers from the generators; and thirdly, how the cost of supplying it to the consumer can be recovered or the consumer persuaded to generate his own requirements by the application of suitable tariffs.

Control of Reactive Power

It is suggested in the paper that an automatic or semiautomatic scheme for controlling reactive power be introduced in England and Wales. This could be done by setting the generators to supply a planned demand of MVAr/MW. This setting might be variable during the period the generator is on load and would be such as would provide satisfactory operating security. At suitable points on the transmission system, compensating equipment such as synchronous compensators would be installed to generate or consume reactive power for unplanned changes in the demand due either to changed flows in the series circuits or changes in the demand by the load. To keep down the provision of this compensating equipment to the minimum, an optimum power factor at bulk supply points would be required and it is shown that this would be 0.93 lag at



Effect of tariff adjustment for power factor on demand charge

A—kVA demand. B—kW + 0·45 (kVAr above 0·4 \times kW). C—kW + 1% for each 0·01 below 0·9 p.f. D—kW + 2% for each 0·05 below 0·85 p.f. E—Increase in annual cost for typical transmission and distribution system

time of peak from the postulated conditions which will arise when the maximum load in England and Wales reaches 30,000 MW.

Cost of Supply

The increased costs of supplying reactive power in this country arise almost wholly in the transmission and distribution system, being due to the increased costs of heavier circuits, increased losses per kW and an increased range of voltage regulation. Curve E in the figure shows the increase in cost for a typical system, including 20 miles of 132 kV overhead line, three miles of 33 kV cable, one mile of 11 kV cable and 100 yd of 415 V cable, with the necessary transformers. The additional costs are expressed as a percentage increase of the demand charge and amount, at 0.8 power factor, to a little less than 10 per cent.

Tariff Adjustments

Three principal methods of tariff adjustment are in use for persuading consumers with inductive loads to provide their own sources of reactive power or, alternatively, reimbursing the Electricity Boards for the additional cost: (a) kVA demand charge (curve A), (b) kW plus kVAr demand charge (curve B), and (c) kW demand charge with adjustment based on average power factor (curves C and D).

The kVA demand tariff is widely used for supply to industrial and commercial consumers, to whom it provides an effective incentive to correct the power factor to about 0.98 by installing static capacitors or other means of local generation of reactive power. This tariff is, however, somewhat inflexible in that the increase in demand charge for a given power factor (e.g. 25 per cent for 0.8 p.f.) cannot be varied. The alternative, having separate kW and kVAr demand charges, is fully adjustable, since these charges can be varied independently and the point of application of the kVAr charge can also be changed. The example shown in curve B gives a consumer an inducement to improve his load power factor to about 0.93 but not higher. This coincides with the optimum value at bulk supply points, as mentioned above.

Tariffs which depend on average power factor usually require measurement of kW demand, kWh and lagging kVArh, the average power factor being derived from the relationship between the kWh and lagging kVArh. Their advantage lies in the simplicity of the metering, but a drawback is that the average power factor may differ widely from that at the time of a consumer's maximum load, to which the increased costs of the Electricity Board are more closely related. The average power factor may be used

^{*} Central Electricity Generating Board.

to adjust the demand charge in various ways, with results such as those shown in curves C and D.

Power Factor Correction

The provision of a tariff inducement for a consumer to generate part of his reactive power requirements gives him freedom to select the most advantageous method. He may, for example, choose a synchronous motor for a drive which is in constant use or he may prefer to rely on static capacitors. In considering these he is likely to seek a return which will enable his capital outlay to be amortised within a short period, such as five years. Comparing for various load power factors the annual cost of a capacitor installation added to the increased kVA demand charge, the consumer has an incentive to correct from a load power factor of o-8 or lower to an optimum of about o-98, but there is no advantage in installing capacitors if the load power factor is as high as o-9.

Similar comparisons can be made for other tariffs, indicating that (unless the load has peaks of short duration) it is economic to correct the power factor almost to the point where the adjustment ceases to apply, e.g. to 0.9 p.f. for the tariff shown in curve C.

DISCUSSION

Mr. J. L. Egginton (C.E.G.B.) took exception to the treatment given by the authors to the question of distribution and transmission where, to simplify their calculations, they had assumed series condensers in the circuits to overcome the difficulty of calculating the effect of voltage drop. At the moment, series condensers were not used for this purpose. The one or two examples in use were of an experimental nature. As the costs given in the paper were based on the assumption that series condensers were used, the figures given for costs of transmission and distribution might not be reliable enough to base a tariff structure on them.

Mr. C. M. Mitchell (Kennedy & Donkin) said it was known from experience that there were many small industrial consumers, taking perhaps a few hundred kVA, who lacked the technical knowledge necessary to appreciate the exact meaning of the concept of kVA. To recover correctly the cost of reactive power, he was tempted to suggest, in view of the paper, that the best solution would be a three-part tariff: a unit charge to cover the fuel costs of generation; a kW charge to cover the capital cost of generation; and a kVA charge to cover the transmission and distribution cost. Whatever basis was ultimately accepted for tariffs, it should be as simple as possible.

Mr. F. H. Birch (North Eastern Division, C.E.G.B.) pointed out the need on a supply system to pay even more attention to the availability of a reserve capacity of reactive power than of a reserve capacity of active power. This might sound revolutionary, but it arose from the fact that in the event of shortage of active power, there was a tremendous rotational inertia on the system which would help and which gave time to get extra plant on the bars and to load up.

Mr. K. C. Parton (G.E.C.), who observed that in discussing the point of application of compensating equipment, the paper assumed that the automatic operation would be controlled by voltage operated relays, suggested the use of closed loop control on these devices. Particularly when large d.c. control shunt reactors were in use,

it would be possible to put on a very fast d.c. control, so that not only would it keep a smooth control of the system at all times, but it would be helpful in conditions when there was a failure and a tendency to voltage instability.

Mr. D. J. Bolton, quoting the following passage from the summary of the paper: "Consideration is given to various forms of tariff adjustment for reactive power supply, leading to a preference for separate charges for active and reactive power demands," said that, unfortunately, the authors had not made that preference in the text of the paper, although all the data they assembled pointed to it. One would have wished that they had had the courage of their convictions represented by their own data and come forward boldly in support of the kVAr tariff.

Dr. E. Friedlander (G.E.C.) said that apart from the economic comparison, the technical points were important. The enormous speed of response obtainable with transductor control should not be overlooked. The time constants or time of response which had been obtained on one MVAr unit had been as high as the order of magnitude of 3-4 cycles of the a.c. supply—this meant less than 0-1 sec—in the transition from minimum to maximum output. He did not think that any synchronous condenser would easily be made to follow this kind of performance.

Mr. S. C. Chu (Enfield-Standard Power Cables) described the authors' method of approach as a useful tool for every system planning engineer. The paper was the first survey of the system on a national basis. Presumably, after the installation of nuclear power stations, the more obsolete steam plants would become available for producing reactive power. It appeared that synchronous condensers would be reduced and would gradually diminish.

Dr. R. A. Hore said that with long-distance transmission, one was lucky to get anywhere near the kVA thermal rating of overhead lines. Over a couple of hundred miles, it was found that by raising the power factor of the load from 0.9 to 0.98, the same power loading could be transmitted with two 330 kV lines instead of three. There was no question that it was economic, but it was impractical for the simple reason that a power system could not be run at peak load all the time.

The place for power factor correction was not on the consumer's premises but was the business of the distribution authority. There should be, not incentive tariffs, but a fair tariff, one which charged the consumer the cost to the supply authority as nearly as possible. Then, the consumer was a free agent to correct or not as he felt inclined—and he probably would not. The supply authority was then able to do it cheaper than the consumer could do it for himself and yet retain complete control over his own system.

Cost to Consumer

Mr. F. Byrne suggested that the main difficulty in putting the idea over to a consumer, whether bulk supply or otherwise, would be explaining why he was expected to pay for a reactive kVA component. There was difficulty enough in explaining the present system of tariffs without adding this technical difficulty. One suggestion which might make the problem easier if the new tariff came into operation would be a change of name from "reactive" to "inactive" kVA, and then explaining to the consumer that

he was being supplied with something he required which was of no practical use.

Mr. P. d'E. Stowell remarked that a great advantage of charging separately for kVAr was that a separate sum appeared on the consumer's account showing how much he was paying. With a kVA tariff, all that was lost sight of; the consumer simply went on paying it and in a lot of cases did not take much notice, whereas with the kVAr charge he paid for his kW and his kVAr. Even his accountant would ask what the kVAr charge was about. So it became exceedingly easy for manufacturers of capacitors to sell them to consumers.

Mr. F. Moores said that for well over 20 years the capacitor manufacturers had been putting in low-voltage schemes at 400 V which were automatically controlled so that the reactive kVA on the system was kept within predetermined limits. The authors had assumed a five-year amortisation period for the consumers' plant and machinery, but after five years the equipment would be just about paid for; it would be a clear gain and everyone would expect it to continue working considerably longer.

Mr. R. O. M. Powell suggested that in 10-15 years' time much of the generating plant now proposed to be used to provide large numbers of VAr would probably be on the scrap heap. He declared that the question of control of capacitors was at times overstated. In the U.S.A. and many Continental countries, large capacitor installations had been made on transmission and distribution systems. Problems in those countries could not be vastly different to our own. In any case, with the present prices of alternative equipment, there was a driving economic reason to use capacitors. This would surely stimulate attempts to overcome what disadvantages there

were in having blocks of reactive power; and, presumably, the transductor/capacitor combination was an example of an attempt to overcome this problem.

Mr. W. Casson, in reply, agreed that there would be a great problem in 10-15 years' time. The old plant would gradually disappear, but there was no doubt that more and more compensation would have to be put in as the years went by. Its form could be varied. It would be possible either to use old generators which were re-installed as synchronous compensators, or to buy new synchronous compensators. It was hoped that the types now being thought of could be mobile to some extent so that they could be moved from place to place.

The larger the compensating plant, the lower the cost. Even so, with the cheapest form of compensation—the shunt capacitor—large sums could be spent in meeting the requirements for reactive power compensation. This problem must be tackled quickly, because the position was rapidly deteriorating. Within a few years, the Generating Board would have a 400 kV system in commission. Then, the question of taking care of the light load condition would be greatly intensified.

Mr. H. J. Sheppard, co-author, said it had been expected that their tariff suggestions would arouse a considerable range of views. They had endeavoured to emphasise the limitations of the kVA tariff as the fixed costs of the system were rising and the running component of the system cost was diminishing. This increase in the fixed costs and, therefore, in the annual fixed charges which had to appear as demand-related costs appeared to be making a kVA tariff increasingly inappropriate as a means of collecting increased revenue from consumers who made substantial demands for reactive power.

NEW BOOKS

Principles of Transistor Circuits: Introduction to the Design of Amplifiers, Receivers and other Circuits. Second Edition. By S. W. Amos, B.Sc. (Hons.), A.M.I.E.E. Pp. 210; figs. Published for Wireless World by Iliffe Books, Ltd., Dorset House, Stamford Street, London, S.E.I. Price 21s.

During the eighteen months following the publication of the first edition in 1959, there have been a number of significant developments in the science of semiconduction. The chief of these has been the replacement of the pointcontact transistor by the drift transistor in r.f. applications. In this second edition all references to point-contact transistors have been omitted and the space saved has been devoted to drift transistors and their applications to pulse amplifiers and v.h.f. receivers. Other new topics included are voltage reference diodes and controlled rectifiers. The sections on transistor multivibrators and on miscellaneous applications of semiconductor devices have been considerably expanded and are now included as separate chapters. The bulk of the book is devoted, as before, to a study of the principles underlying the circuit design of transistorised equipment. A large number of worked examples are included. Although the design of amplifiers and receivers is given the greatest prominence, some details are also given of photo-sensitive devices and relaxation oscillators.

Radio and Electronic Components. Vol. V: Wires and R.F. Cables. By G. W. A. Drummer and W. T. Blackland. Pp. 239; figs. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 478 6d.

This book is number five in a series dealing with electronic equipment components. Volumes I, II, III and IV cover fixed resistors, variable resistors, fixed capacitors and variable capacitors respectively. The first part of this volume covers wires and sleeving and contains five chapters dealing with their choice, manufacture, measurement and test procedures, faults and developments. Part II is concerned with radio-frequency cables and comprises seven chapters on similar aspects of the subject. In addition, there is a chapter dealing with specifications and publications on connecting wires, sleeving and r.f. cables, also bibliographies and an appendix giving characteristics of British Services types of r.f. cables.

Modern Wiring Practice. Fifth edition. By W. E. Steward. Pp. 228; figs. George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

This fifth edition is in accordance with the 13th edition of the I.E.E. Wiring Regulations, and with recent amendments to British Standards relating to wiring practice.

Financial Section

STOCKS and SHARES

THERE has been no sign of trepidation in the approach of Stock Exchange markets to this year's Budget. In the industrial market the buyers maintained their ascendancy well enough to project all the recognised share-price indices to new altitude records. In the electrical sections, the shares of the major groups, rather disappointingly, have failed to maintain last month's recovery, and those associated with some domestic appliances have been subdued by the reports of a still substantial accumulation of stocks. There was a reminder of this in the General Electric Co.'s decision to cut sharply the prices of some television sets with the object of clearing the way for this year's models. Generally, however, the market trend has remained firm.

Electrical Shares

G.E.C. shares were a little unsettled by the announcement on television set prices, but on balance have held their value comparatively well over the first part of this month, while those of English Electric, A.E.I., and Crompton Parkinson lost some ground. After a good deal of fluctuation, Reyrolles showed a net improvement of 3s od, to 48s 9d, as a sequel to the declaration of an increase in the dividend from the equivalent of 83 to 93 per cent, accommodated comfortably by an 11 per cent expansion in profits. C. A. Parsons were the same amount to the good at around 61s 3d in advance of that company's preliminary statement on the 1960 results.

Rising Prices

Price changes marked in the accompanying share tables cover the three weeks including the Easter holiday and reflect a persistent growth of optimism about investment prospects in many sections of the industrial market. Outstanding among many substantial improvements were the rises of 9s 9d in I.C.T.; of about six and seven shillings respectively in Decca and Plessey; of four to five shillings in E.M.I., Ward & Goldstone, Thorn Electrical, Pyrotenax, M.E.M. and Bulpitts (the subject of various rumours); and of two to three shillings or more in others, including Elliott-Automation, Hoover, Electric Construction and Strand Electric, the last named being stimulated by the company's forecast of an increase in the dividend to a total of 20 per cent.

Dividends Declared

Sangamo Weston 10s shares have retained the very sharp rise to 34s 6d

which followed the company's announcement of a 24 per cent improvement in last year's trading profits, an increase in the dividend from 11 to 13\frac{1}{3} per cent (covered 2\frac{1}{2} times by earnings), and a proposed one-

Price Changes in

				Three Weeks' Rise	Dividend			1961		
Company or E	oard	Nom. Value	price 10th April	or	Pre- vious	Last	Yield %	High-	Lowest	
	Gilt-ed	ged Stocks					£sd			
Brit. Elec. 1968/73		100	741		3	3	4 0 6	742	733	
Brit. Elec. 1974/77	•••	100	70		. 3	3	4 5 9	70}	69½	
Brit. Elec. 1976/79		100	731		31	38	4 15 3	73½	711	
Brit, Elec. 1974/79		100	81		41	41	5 5 0	82	80 ½	
Brit. Elec. 1967/69		100	91		41 /	41	4 19 0	91½	89 ½	
		as Electric S	ubbly							
Calcutta Elec	414	£1	21/-		7 †	7	11 14 0	21/6	20/6	
ast African Power	•••	£1	14/6		8	10	13 16 0	15/-	13/3	
Nigerian Elec		£1	18/-		8	10	11 2 6	.19/9	15/6	
erak Hydro-Elec.		£1		+1/-	10	10	10 0 0	20/-	17/6	
		cal Shares		,				,	· ·	
berdare Holdings	i	5/-	15/9×.d.	+9d	171	I 7 }	5 11 0	16/-	14/3	
erialite		1/-	7/6		54	54	7 4 3	7/6	6/9	
Ilen, W. H.		£1	38/6	+6d	14	10*1	5 4 0	39/- *	36/-	
Illied Insulators		5/-	9/6		20	10*	5 5 3	9/6	8/9	
lwyn Holdings	***	5/-	26/6	+1/6		12 <u>1</u>	2 7 3	27/-	24/6	
inglo-Portuguese Tel.	***	£1	21/-	-1/-	9	9	8 11 6	25/-	20/9	
rcolectric	***	1/-	5/6	+6d	15	15	2 14 6	6/	3/9	
ron Meters	•••	£)	70/-	+2/-	115	15	4 5 9	70/-	67/6	
ssoc, Elec, Ind. Ord,		£1	44/9	-2/-	15	15	6 14 0	48/6	39/6	
utomatic Tel. & El.	***	5/-	19/9	+3/-	17	17	4 6 0	19/9	14/9	
abcock & Wilcox	***	£1	33/9	 2/-	13	9	5 6 9	35/9	30/3	
akelite	,	10/-	₋ 56/-	+4/9	171	171*	3 2 0	56/3	42/-	
aldwin, H. J	***	2/-	1/6		20	—	_	1/6	1/6	
erry's Electric		5/-	48/9	+1/-	30	30*‡	3 1 6	49/-	37/-	
owthorpe Holdings	***	2/-	9/6	+6d ·	27	18½*	3 17 9	9/6	8/-	
rit. Elec. Resistance	***	2/-	, 8/3	—6d	17분	171*;	4 4 9	8/9	6/6	
rit. Elec. Traction:										
Def. Ord. "A"	***	5/-	54/-	+3/3	35	40	3 14 0	54/-	41/9	
rit. Electronic Ind.	***	5/-	14/9	+1/-		15‡	5 1 9	15/-	12/3	
.l. Callender's		£1	59/-	+1/	13½	131	. 4 11 6	59/-	49/6	
.l. Callender's 6% Pr ritish Thermostat		£1	17/6	1.0	6	6	6 17 3	18/3	17/6	
	***		36/3 49/6	-1/9	35	20*	2 15 3	40/-	28/-	
	***		10/3		25 ·	25* 40*	5 1 0 3 18 0	49/6	47/-	
1. 1	***		23/-	+5/-	15	161	3 10 9	10/3	7/9	
urco Dean	•••	5/-	9/6	+3d	18	15	7 18 0	26/3	16/9	
Cable & Wireless			19/3x.a.	+2/-	10			10/-	8/9	
ambridge Instrument		5/-	36/-	+4/-	121+	10* 22	2 12 0 3 I 0	19/3	12/6	
Chloride El. Storage "		£1	87/-x.d.		171	20	4 12 0	36/3 91/-	30/-	
Clarke Chapman		£1	53/9	+5/-	133	133	5 2 3	54/-	72/-	
Combined Elec. Mfrs.		4/-	. 9/6	+6d		1251	5 5 3	9/6	43/6	
Contactor Switchgear		5/-	15/6	1 00	14	14	4 10 3	16/		
Cossor, A. C		5/-	6/6	—3d	5	Nil	110 3	8/-	14/6 6/6	
Crabtree		10/-	31/3	- 1/3	20	121*	4 0 0	33/9	26/3	
Crompton Parkinson	0.00	5/-	13/6	6d	14	121*	4 12 6.	14/-	11/3	
Davis & Timmins		5/-	41/6	+6/3	25	35*	4 4 3	41/6	30/3	
e La Rue		10/-	61/-	+2/3	22 }	22½‡	3 13 9	64/6	55/-	
Decca " A "		10/-	69/6	+6/6	20	23½	3 7 0	69/9	52/3	
esoutter	***	5/-	56/3	+3/3	30	35 -	3 2 3	56/3	49/-	
ewhurst		2/-	10/3	+6d	20	20	3 18 0	10/3	7/6	
Dictograph Tel	***	2/-	11/9	—3d	20	20*	3 8 0	12/-	8/6	
Dimplex	***	5/-	67/6x.d.		_	30	1 17 0*	71/-	47/9	
Subilier Condenser	***	1/-	3/-	+3d	25	30 -	5 0 0*	3/-	2/3	
uport		5/-	15/9	+6d	171	20	4 4 3*	16/-	12/6	
.M.I	***	10/-	50/3	+4/3	20	178*	3 9 3	51/3	41/6	
leco	:	2/-	8/3	+1/-	20	20	2 8 6*	8/3	4/3	
lectrical Apparatus	***	5/~	17/3		141	20	5 16 0	17/9	17/-	
lectrical Components		5/-	9/6 [™]		15	112*	6 1 0	9/6	9/-	
lec. Construction	-44	£1 -	38/9	+3/3	9	9	4 13 0	39/-	30/6	
Iliott-Automation	***	5/~	32/6	+3/9	9.3	12‡	1 17 0	32/6	25/6	
infield Rolling Mills		£1	48/6x.d		15	15	6 3 9	51/6	46/3	

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

* After scrip issue. † Free of income tax. ‡ Dividend indicated.

for-three scrip issue. The yield on the shares is now 3.8 per cent, and it has been noted that after previous scrip issues there has been a less than proportionate scaling down of the dividend rate. Aberdare Holdings 5s shares

have moved up to 158 9d, ex-dividend, since the declaration of a seventh successive dividend of 17½ per cent, from slightly reduced earnings. Davis & Timmins at 418 6d reacted strongly to news of substantially higher earnings

Electrical Investments

				Three Weeks' Rise	Dividend		V	1961	
Company or B	oard	Nom. Value	price 10th April	or	Pre- vious	Last	Yield %	High- est	Low- est
	Electric	cal Shares—	continued				£sd		
English Electric	***	£1	37/-	3/-	10	10	5 8 0	40/9	32/-
English Electric 33% Pr		£1	11/-	-,-	33	38	6 16 6	11/9	11/-
Ericsson Tel	***	5/-	28/9	+1/9	13†	13†	3 14 3	28/9	23/3
Ever Ready	***	5/-	36/6	+2/-	271	20*	2 14 9	36/6	31/6
Falk Stadelmann	***	£1	25/-	+6d	10	7 <u>1</u>	6 0.0	25/-	21/9
G.E.C	***	£1	37/-	+9d	10	10	5 8 0	40/-	29/3
G.E.C. 6½% Pref General Cables	***	£1	18/9		6 <u>1</u>	61	6 18 9	19/3	18/3
General Cables Goblin (B.V.C.)	***	5/-	5/9 7/6	6d	15 12½	Nil IO	6 13 3	6/3 8/6	3/9 6/-
Hackbridge Holdings					_				
Harland Engineering	•••	5/-	6/3 17/6	−6d −6d	20	20 16*	8 0 0* 4 II 6	6/9 19/-	5/- 15/6
Head Wrightson			25/-	+1/3d	20	14*	2 16 0	25/-	22/-
Heatrae	***	2/-	15/6	+3/-	20	22½	2 18 0	15/6	12/6
Holophane	***	5/-	19/9	+9d	26	30	7 12 0	19/9	17/3
Hoover Hunt, A. H	***	5/-	53/9 24/3	+3/9 +6d	90 20	45* 20	4 3 9 3 6 0	53/9 25/9	46/- 18/-
Intl. Combustion	***	5/-	31/-	+6d	30	30	4 16 9	31/-	24/-
Intl. Computers & T.	***	£1	96/-	+9/9	0	11	7 10 7	96/-	59/-
Johnson & Phillips	•••	£1	20/9	2/-	5	Nil		22/9	17/6
			5/9	-1-	3	1411		6/-	5/3
	***						Brane .		
Laurence Scott	***	5/-	18/9	+1/6	15	15*	4 0 0	18/9	15/3
Lister, R. A Lucas, J	***	£1	55/- 66/9	+1/-+1/9	14 12 <u>1</u>	14 132	4 2 6	55/- 66/9	47/3 62/-
						_			13/9
Marryat & Scott Mather & Platt	***	2/-	17/- 44/6	+1/-	22½	27½	3 4 9 4 18 9	17/- 51/6	41/6
Metal Industries	***	£1	64/6	-1-	14	15	4 13 0	64/6	53/-
Midland Elec. Mfg.	***	£1	64/3	+4/3	12	12	3 14 9	64/3	58/6
Murex		£1	47/6	+3/6	15	20	4 16 0*	47/6	39/3
Newman Ind	***	2/-	6/-	+3d	121	15	5 0 0	6/-	5/-
Oldham & Son	•••	1/-	3/-	+3d	171	17½*‡	5 10 0	3/-	2/3
Parsons, C. A		£1	61/3	+3/9	81	98	3 1 0	61/3 .	46/9
Philips' Lamps	***	Fl.10	260/-	+10/-	16	16*	1 4 0	131	£10½
Plessey /	***	10/-	59/6	+7/-	15≟‡	17‡	2 17 0	59/6	46/6
Pullin, R. B	***	2/-	14/6 58/9	+1/9 +5/3	25 34	25 40	3 9 0	15/- 58/9	11/3 46/6
Pyrotenax	•••	5/-			6	12	6 19 0	35/3	31/6
Radiation Reliance-Clifton	***	£!	34/6 27/6	+6d +1/6	15	15	2 14 6	27/9	22/6
Reyrolle		£1	48/9	+3/9	171	93*	4 0 0	48/9	36/6
Richardsons Westgarth	***	10/-	8/9	+2/3	81/3	81	_	7/-	6/6
Sangamo Weston	***	10/-	34/6	+6/3	121	131	3 17 0	34/6	26/3
Scott, James	•••	5/-	25/9		24	25*	4 17 0	27/9	25/6
Simon Engineering	***	5/-	38/-	+2/-	一 17½	26·6‡ 20	3 10 3	38/- 22/3	28/- 17/-
Smith (England), S. Southern Areas	***	4/- £!	22/3 19/-	+4/- +1/- ·	5	6	6 6 3	21/-	14/6
Strand Elec		5/-	19/-x.d.	+3/-	14-6	20‡	5 5 3	20/-	12/3
Sturtevant	***	5/-	15/6		15†	15†	7 19 0	18/6	13/9
Sun Elec	***	5/-	17/3		15	18½	5 7 3	17/6	17/-
T.C.C	***	10/-	41/-		35	22½*	5 9 9	41/-	40/-
Telephone Rentals	***	5/-	28/3	+2/3	12½ 25	15*	6 13 3	28/3 16/9	21/9
Thompson (John) Thorn Elec	•••	5/-	15/- 62/6	-1/6 +5/-	20	25	2 0 0	63/-	44/6
Thorn Elec Thornycroft	•••	£I	28/-	-2/-	6 -	6 .	4 5 9	34/9	25/9
Tube Investments		£1	85/-	+6d		14	3 6 0	85/-	72/6
Ultra Electric	***	5/-	22/-		20	25	5 13 9	22/6	12/6
Walsall Conduits	***	4/-	14/-	+1/9	22½	15*	4 5 9	14/-	10/9
Ward & Goldstone	•••	5/-	35/9	+5/3	30	35	2 9 0*	35/9	25/6
Watford		2/-		-1/3	25	20*	4 14 3	10/9	8/6 36/-
Westinghouse	***	£1	41/-	+6d	11 12½	11 12½*	5 7 3 4 II 0	42/ 14/6	36/- 11/6
West, Allen	***	5/-	13/9 14/-	6d ; +3d ∖	12g	21*	-	15/3	11/9
Wilkins & Mitchell Wolf Electric		5/-	17/6	+1/3	12½	13≗	3 18 6	17/6	14/-
WOIT EIECTFIC	***	··· 9/-	17/0	113	2				

and distributions, and of a scrip issue to come.

Ericsson's Order Book

The 5s shares of Ericsson Telephones had responded well last month to the report of largely improved earnings in 1960, and they were advanced further to 28s 9d after Sir Harold Wernher's review at the annual meeting. One of the points made by the chairman was that the market quotation of the shares did less than justice to the true value of the group's assets, but the parts of his speech which made the most favourable impression were those referring to a well-filled order book and to the assurance of a high rate of productivity throughout the current year. There is no change this year in the company's 13 per cent net dividend rate, on the basis of which the shares now show a yield of 3\frac{3}{4} per cent gross.

Chloride Electrical

The £1 shares of Chloride Electrical Storage have eased appreciably, to 87s ex-dividend, since the declaration of an increase in the dividend, but show nevertheless a net gain of some 12s 6d since the beginning of the year. No doubt the advance has been based partly on the general evidence of revival in the motor-car factories, but the company's preliminary announcement of profits for 1960 within 2 per cent of the previous year's figures was regarded as a noteworthy achievement in relation to the deterioration in trading conditions between the two years. The directors' decision to raise the dividend by the equivalent of $2\frac{1}{2}$ to 20 per cent was also taken as a sign of confidence in the outlook. Earnings cover the new rate rather less than twice over, and the yield on the shares goes up to more than $4\frac{1}{2}$ per cent.

Watford Electric

There has been a decline of around 1s, to 8s 6d ex-dividend, in the 2s shares of Watford Electric & Manufacturing as a sequel to the company's report of approximately halved trading profits in 1960, although the dividend is being maintained and the factor responsible for a severe disruption of work in the first part of the last year was evidently of a temporary nature. With production now expanding, and the value of orders received at a very high level, the directors look forward to improved results this year. As a further means for raising output they are negotiating for the acquisition of another factory, and are considering a "rights" issue of new shares to finance it. There is no difficulty in paying the 20 per cent dividend (effectively the same rate as before) with a comfortable margin.

REPORTS and DIVIDENDS

G.E.C. Bid for Radio & Allied Criticised.—At an extraordinary meeting in London last week three shareholders maintained that the price being paid by the General Electric Co., Ltd., for Radio & Allied (Holdings), Ltd., was too high.

Mr. A. L. G. Lindley, the chairman, said in reply that the deal would call for the issue of five million shares which would require £500,000 a year to cover the 10 per cent dividend paid by G.E.C. In return, G.E.C. would receive £800,000 gross on the basis of last year's profits of Radio & Allied.

"The deal is very much in the interest of shareholders of G.E.C. and R. & A.", declared Mr. Lindley.

He announced that proxies received by the board showed four million votes in favour and only 18,900 against. On a show of hands the resolution was carried.

H. J. Baldwin & Co., Ltd.—The directors have decided to pass the half-yearly dividend on the 7 per cent cumulative preference shares due and payable on 31st March, 1961. The last payment was made on 30th September, 1960, in respect of the six months ended on that date.

It is proposed to defer further payment pending ascertainment of the group result for the current financial year ending this month, in conjunction with an assessment of the effect of the reorganisation of the operating and trading methods of the company and its subsidiaries. This was referred to by the chairman in his recent review accompanying the report for the past financial year.

Ericsson Telephones, Ltd.—Sir Harold Wernher, chairman, said at last week's meeting that the order book was substantial and ensured a high rate of production throughout the current year. To cope with the heavier load, the capacity of the Beeston and Sunderland factories was being increased.

Sir Harold said there was always a steady and dependable demand for telephone service and he maintained that there was no excuse for applying half-hearted measures in telephone development. The rate of growth in this country was below that of the 15 major industrial countries. This was not due to any lack of skill on the part of British engineers and the position could be remedied if capital was made available, supported by greater publicity and sales effort.

In a reference to the company's

fixed assets, he stressed that the value of these was greatly in excess of the balance-sheet figure, which in his opinion was not fully reflected in the market price of the company's shares. On exports, he said that firms with no direct export trade themselves could help by keeping their prices to exporting firms at fair economic levels. Wage increases could not be recovered on export contracts and "wild-cat" strikes did tremendous damage to British trade abroad.

Desoutter Brothers (Holdings), Ltd.—Mr. G. H. Webb, chairman, says that the order position of the group is very good, with outstanding work much greater than at this time last year. The home market, he adds, shows a little falling off in some directions, although the general picture remains encouraging. In the export market the demand continues to be strong. The group net profit increased from £396,277 to £436,928, and the dividend is effectively raised by 5 per cent to 35 per cent.

Scottish Cables (South Africa), Ltd.—At the annual meeting held at Pietermaritzburg, Natal, on 7th April Mr. William Fraser, the chairman, said that at present the demand for the company's products was being well maintained. Nevertheless the economy and prosperity of the Union of South Africa might be influenced by the decision to become a republic and he hesitated to make "any undue commitments."

Belling & Co., Ltd., increased its sales by 23 per cent in the year to 30th March last.

Mr. C. R. Belling, the governing director, in his yearly report to the company's 3,000 employees, discloses that for the year just started the company has set a target of a 25 per cent increase in production and sales and it is hoped by increased efficiency to improve the margin of profit.

Under the company's profit sharing scheme a sum of £180,000 will be available for the past year and will make the total distribution over the last 13 years well over £1 million.

Southern Areas Electric Co., Ltd., is raising its dividend from 5 per cent to 6 per cent for 1960.

Group profits total £65,667 (£65,691), after depreciation £59,754 (£60,814) and £6,844 (£8,390) off patent rights and development. Tax takes £17,885 (£21,888), leaving the net profit at £47,782 compared with

£43,803 previously. The amount dealt with in the accounts of the holding company is £32,393 (£44,616). After deducting £12,500 obsolescent provision arising from previous years, £169,766 (£163,277) goes forward.

It is stated that a satisfactory increase took place in the order book towards the end of 1960, and has since been maintained.

Herbert Morris, Ltd., is maintaining its interim distribution at 4 per cent. It is stated that although the value of orders in hand is greater than at the corresponding date of 1960 increased production costs are reducing the profit margin. Moreover the company has experienced a shortage of skilled labour which may prevent the achievement of the improved results forecast last year.

Strand Electric Holdings, Ltd.—In declaring an interim dividend of 8 per cent against the previous equivalent of $4\frac{2}{3}$ per cent, the directors state that on information available they expect to be able to recommend a 12 per cent final dividend for the year to 30th April, 1961.

A. Reyrolle & Co., Ltd.—A final ordinary dividend of $6\frac{1}{2}$ per cent, making $9\frac{3}{4}$ per cent for the year, has been declared. The net profit for the year, after providing for taxation, was £1,560,306 (against £1,428,021). Last year the ordinary dividend totalled $8\frac{3}{4}$ per cent.

Simon Engineering, Ltd., has made its first report since it was formed by merging Henry Simon (Holdings), Ltd., and Simon-Carves, Ltd. The profit for 1960 was £1,344,596, after providing for depreciation, taxation, etc., and the final dividend is 17½ per cent, making 27½ per cent for the year, against a forecast of 26¾ per cent.

Relay Exchanges, Ltd.—A final dividend of $12\frac{1}{2}$ per cent is recommended, making $20\frac{1}{2}$ per cent for the year. The group profit for the year after meeting all charges, including taxation, was £1,024,825 (against £1,112,957).

Newman Industries, Ltd., announces an increase in net profits (after tax) from £88,645 in 1959 to £102,086 last year. The dividend is raised from $12\frac{1}{2}$ to 15 per cent.

New Companies

Lectraheat, Ltd.—Registered 24th March. Capital £100. Manufacturers, hirers, letters on hire, maintainers, and repairers of, agents for and dealers in electrically operated heating apparatus and central heating systems, etc. Directors: F. Bates and R. M. Bates. Solicitors: Raymond J. Moore, Leicester.

Lewis Electrical Heating Automatics, Ltd.

—Registered 14th March. Capital £2,000.

To acquire the business of electrical equip-

ment manufacturers carried on by C. R. J. Lewis as Lewis Electrical Heating Products at 449, West Green Road, N.15, etc. Directors: C. R. J. Lewis and Ruby C. Lewis. Secretary: A. W. W. Webb. Regd. office: 3, North Way, Montagu Road, N.9.

Cobmin, Ltd.—Registered 21st March. Capital £10,000. To enter into an agreement with Meameco (Private), Ltd. (registered in India) and to act as agents for the British manufacturing companies named in the agreement, etc. The subscribers are: Anderson Boyes & Co., Ltd., and John Tinsley, Ltd. Directors: J. Anderson, B. A. Higgins, J. E. P. Mills and D. F. Stewart. Solicitors: Nicholas Williams & Co., 88/90, Chancery Lane, W.C.2.

J. G. Gibbons & Sons, Ltd.—Registered 14th March. Capital £2,000. Electrical engineers and contractors, mechanical and general engineers, radio engineers, etc. Directors: J. G. Gibbons and Winifred Gibbons (secretary). Regd. office: 136, Conway Road, Colwyn Bay, North Wales.

K. W. Nickerson, Ltd.—Registered 8th March. Capital £1,000. Contractors for the installation of all kinds of heating, lighting, etc. Directors: Kathleen W. Nickerson (secretary) and A. W. Nickerson. Regd. office: 112, Colmore Row, Birmingham, 3.

Electrical & Civil Services (Engineers), Ltd.

Registered 23rd February. Capital £1,000.
Regd. office: 28, Station Road, Port Talbot,

D.E.S. Electronics, Ltd.—Registered 10th March. Capital £500. Electronic engineers, etc. Directors: W. C. Turner, R. C. Verlander, R. Thomas, F. Thrower, H. J. Pierpoint, E. F. R. Bell, C. Morgan (secretary) and L. Dunnell, Regd. office: 2/4, Pepys Road, S.W.20.

John R. Morgan (Electrical), Ltd.—Registered 13th March. Capital £100. Directors: J. R. Morgan (secretary) and Andrena S. Morgan. Regd. office: 87, Lord Street, Liver-

J. F. Milward, Ltd.—Registered 13th March. Capital £1,500. Manufacturers of and dealers in electrical equipment, etc. Secretary: Dorothy M. Graeme, 61, Fairview Avenue, Gillingham, Kent.

Duke & McBride, Ltd.—Registered 8th March. Capital £100. Electrical contractors and engineers, manufacturers of, agents for and dealers in radio and television sets, washing machines, vacuum cleaners, refrigerators, etc. Directors: H. Duke and B. R. McBride (secretary). Regd. office: 2, Glebelands Road,

Economy Central Heating, Ltd.—Registered 8th March. Capital £100. Central heating engineers, electricians, electric and gas engineers, etc. Directors: I, R. Woollard and A. T. Woollard, Solicitors: Smallman & neers, etc. Direct A. T. Woollard. Son, Maidenhead.

Whitesmith, Ltd.—Registered 8th March. Capital £5,000. Electricians, electrical and electronic engineers and contractors, manufacturers of and dealers in television sets, etc. Secretary: G. A. Gould. Regd. office: 68, Argyle Street, Birkenhead.

Bunting, McConnell & Co., Ltd.—Registered 14th March. Capital £100. Manufacturers and factors of and dealers in electrical accessories and appliances, etc. Directors: S. B. Smith and June V. Smith (secretary). Regd. office: Prospect Hill, Kidderminster.

F. G. Brownings (Sussex), Ltd.—Registered 14th March. Capital £1,000. Electrical engineers and contractors, etc. F. G. Brownings is the first director. Secretary: Dorothy A. Worsley. Regd. office: 66, Clyde Road, Brighton, 7.

Rem Products (Electrical), Ltd.—Registered 14th March. Capital £100. Directors: L. F. Mooney and Mrs. Ivy M. Mooney (secretary). Regd. office: 293, London Road, Hadleigh,

J. L. Burrell, Ltd.—Registered 15th March Capital £5,000. To acquire the business of an electrical engineer and radio and television dealer now carried on by J. L. Burrell at 1294/1296, Leeds Road, Thornbury, Bradford, and 1005/7, Wakefield Road, Bradford, as J. L. Burrell. Directors: J. L. Burrell and L. Wooler (secretary). Regd. office Leeds Road, Thornbury, Bradford. office: 1294/6,

Lipsner-Smith Co., Ltd.—Registered 15th March. Capital £20,000. Electrical, electronic and radio engineers and contractors, mechanical and general engineers and engineering contractors, etc. Solicitors: Kaufman & Seigal, 72, New Cavendish Street, W.1.

Accumulator Services Co., Ltd.—Registered 14th March. Capital £5,000. Manufacturers and repairers of and dealers in electrical accumulators, batteries, acids and containers, etc. Directors: H. F. Banks (secretary) and Edna A. Banks. Regd. office: 60, Oxhill Road, Handsworth, Birmingham.

Practical Research & Production, Ltd.—Registered 20th March. Capital £100. To acquire the business of a manufacturer and acquire the business of a manufacturer and dealer in electrical appliances carried on by G. A. H. Lambert at Winscombe, Som., as Western Marketing, etc. Directors: G. A. H. Lambert and Mrs. Joan Lambert (secretary), Dolphin Cottage, Winscombe, Som. Regd. office: Brown's Corner, Winscombe, Som.

Domestic Washing Machine Services (Wolverhampton), Ltd.—Registered 20th March, Capital £100. Electrical and mechanical engineers, etc. Directors: A. W. R. anical engineers, etc. Directors: A. W. R. Atkins and Mary W. Atkins (secretary), Regd. office: 12, Pipers Row, Wolverhampton.

Coolcraft, Ltd.-Registered 16th March Capital £5,000. Manufacturers of and dealers in refrigerators, etc. J. A. McGibbon is the first director. Regd. office: Dickerage Lane, New Malden.

W. Mearns & Co., Ltd.—Registered 15th March, Capital £10,000. Electrical wholesalers, etc. Directors: W. Mearns, Mrs. Nellie Mearns and P. D. Mearns (secretary). Regd. office: 156, New Bridge Street, Newcastle-on-Tyne.

M.G. Electrical (Brentwood), Ltd.—Regisengineers, etc. Directors: Betty M. Norrington and H. Norrington. Secretary: Patricia B. Marks. Reg wood, Essex. Regd. office: 265, Ongar Road, Brent-

J. & W. Electrical, Ltd.—Registered 16th March. Capital £100. Electrical contractors, manufacturers of and dealers in electronic, electrical and mechanical appliances, etc. Directors: W. P. Johnson, H. Wakefield and A. W. Francis (secretary). Regd. office: 38, Rood End Road, Oldbury, Worcs.

Thos. Harrison (Newcastle), Ltd.—Registered 17th March. Capital £1,000. Electrical engineers and contractors, manufacturers, importers and exporters of and dealers in radio apparatus, etc. Directors: T. E. M. Harrison, Elna S. Woroniak and A. M. Wilson (secretary). Regd. office: 118, Stanhope Street, Newcastle-upon-Tyne.

Lowe & Morgan, Ltd.—Registered 20th March. Capital £1,000. Electrical engineers, etc. Directors: H. C. C. Lowe and J. R. Morgan. Secretary: Kathleen J. Morgan. Regd. office: 46, New Road, Great Baddow.

Heat Extraction, Ltd.—Registered 20th March. Capital £500. Manufacturers of and dealers in refrigerators and cold storage machinery, etc. Directors: W. A. Hall, W. J. P. Hall and K. Blakemoor (secretary). Regd. office: 33, Blossom Street, Manchester 4. chester, 4.

Fishenden's (Electrical), Ltd.—Registered 20th March. Capital £4,000. To acquire the business of electrical contractors, carried on by K. A. Fishenden at 280, Wickham Road, Shirley, Croydon, Surrey. Directors: K. A. Fishenden and Mrs. Joan Fishenden. Secretary: Joan Burgess. Regd. office: 280, Wickham Road, Shirley, Croydon, Surrey.

G. C. Collins Electrical Contractors, Ltd.-Registered 21st March. Capital £100. Margot Bothwell Owles is the first director. Regd. office: 5, Main Parade, Chorley Wood, Herts.

Meetings of Creditors

Ladybird Electric Motors, Ltd.—Meeting of creditors on 20th April at Winchester House, Old Broad Street, London, E.C.2.

Phillips & Dart (Electrical), Ltd.—Meeting of creditors on 2nd May at the Bonnington Hotel, Southampton Row, London, W.C.1.

Winding-up Orders

Longford Electric Co., Ltd., 141, Stamford Hill, London, N.16, formerly of 6-8, Gros-venor Street, Manchester.—Winding up order

Oslo Electronic, Ltd., 1, Westbourne Park Mews, London, W.2, formerly of 10, Lyons Place, St. Marylebone, London, N.W.8.— Winding up order made 27th March.

Liquidations

Astoria Electrics, Ltd.—Meeting of members 5th May at 111, Moorgate, London, E.C.2, to receive an account of the winding up from the liquidator, Mr. B. Goodwin.

Litmarts Electrical, Ltd., electrical appliance dealers, 25, New Station Street, Leeds.—Winding up voluntarily. Liquidators, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, and Mr. J. A. Shires, 24, Basinghall Street, Leeds, appointed by members on 27th March 27th March.

British Ferrocart Co., Ltd., electrical manufacturers, Magnet House, Kingsway, London, W.C.2.—Winding up voluntarily. Liquidator, Mr. J. R. M. Valentine, 3, London Wall Buildings, London, E.C.2, appointed by the company on 23rd March. Particulars of claims to the liquidator by 30th April. This notice is purely formal; all known creditors have been or will be paid in full.

Bankruptcies

L. Treadgold, radio, television and electrical retailer, 198, King Street, Alfreton, Derbys.—Receiving order made 27th March on debtor's petition

B. Jones and B. Rocis, formerly carrying on business under the style of Dean Electrics at 13-14, Pembroke Buildings, Swansea, and at 26, Commercial Road, Pembroke Dock, Pembroke, and previously at 8, Pembroke Buildings, Swansea, retailers of household electrical equipment. Public examination 29th May at the Law Courts, Guildhall, Swansea. Swansea.

L. Filby and G. D. Brown, lately trading and carrying on business in co-partnership as Filby & Brown at 44, Park Street, Brighouse, Yorks., radio, television and electrical engineers.—Trustee, Mr. J. L. Williams, 20, North Parade, Bradford, released 27th March.

Mr. W. D. Mackin, electrical retailer, carrying on business under the style of Tyne View Electrical Sales and Service at 34, Tyne View, Lemington, and 28, Wansbeck Road, Gosforth, Northumberland.—Trustee, Mr. E. Taylor, 30-32, Grey Street, Newcastle-upon-Tyne, appointed 28th March.

T. R. Thomas and E. Jones, carrying on business in co-partnership as T. R. Thomas & Co. at "Golden Key," Union Street, Dowlais, Glam., electrical, television and radio engineers.—First dividend of 2s in the £ payable at 106, Walter Road, Swansea.

Separate estate of E. Jones.—First dividend of 6s & d in the £ payable at the above address.

K. Ashmore, carrying on husiness at 230.

of 6s &d in the £ payable at the above address.

K. Ashmore, carrying on business at 939,
Wakefield Road, Bradford, Yorks., as an electrical contractor and formerly carrying on business at the same address and at 80, Leeds Road, Windhill, Shipley, Yorks., and 370, Leeds Road, Bradford, under the style of R.S.M. Machines as a retailer of sewing machines.—Public examination 15th May at the County Court, Manor Row, Bradford.

S. I. Barnes electrician, 32, Baleigh Road.

S. J. Barnes, electrician, 32, Raleigh Road, Coventry, formerly carrying on business at 3, Pim Street, Antrim Road, Belfast, as an electrical contractor.—Trustee, Mr. W. H. Haigh, Somerset House, 37, Temple Street, Birmingham, released 23rd March.

V. P. Jackson, carrying on business at 311-313, Aigburth Road, Liverpool, as Vincent Jackson, electrical and radio engineer.—Last day for receiving proofs for dividend 21st April. Trustee, Mr. S. O. Henry, 5, Rumford Place, Chapel Street, Liverpool, 3.

W. T. Spencer, electrician, 376, Oldham Road, Newton Heath, Manchester.—Last day for receiving proofs for dividend 28th April. Trustee, Mr. W. H. Meredith, 20, Byrom Street, Manchester, 3.

NEW ELECTRICAL EQUIPMENT

HEAVY DUTY CABLE TRAYS

As an addition to the standard Admiralty specification cable tray, N. GREENING & SONS, LTD., P.O. Box 22, Britannia Works, Warrington, Lancs, have produced a stronger pattern known as "RF.6" for heavy cable work. These trays differ from previous patterns in that the edge of the trough is formed into a narrow inverted "U" section which adds strength and permits the butt-jointing of the trays by the use of special connecting bars which fit within the turned-over section of the tray edge. The trays are available from 6 to 24in wide in 8ft lengths and a variety of surface finishes. There is a complete range of matching tees and bends with suitable coupling pieces.

STORE LIGHTING FITTING

A new fluorescent lighting fitting, developed especially for use in stores and shops, has been introduced by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, London, W.C.2. The fitting will accommodate four 80 W tubes and consists of a "Perspex" diffuser with black p.v.c. ends carried

on a white stove-enamelled gear tray. The switchless start gear is mounted inside the fitting and mains connection is by means of two fused terminal blocks, one to each pair of tubes. The ends are integral with the diffuser, and the whole diffuser can be lifted off complete, for cleaning and access to the interior.

Although suitable only for pendant mounting, the fitting can be mounted within 4in of the ceiling—the minimum distance necessary for removing the diffuser. It has 40in fixing centres and measures just over 62in long by 21in wide by $5\frac{1}{2}$ in deep. The weight is 55 lb and the price is £45.

FLOAT LEVEL CONTROL

An automatic float level control manufactured by Flygt International in Sweden is now being marketed in this country by INDUSTRIAL PUMPS, LTD., of Nottingham. It can be used in a variety of fluids and the outer body is oil resistant. The 10 A mercury switch is housed within a pear-shaped body and cuts in or out at predetermined levels according to the rise or fall of the liquid. Installation

costs are low as all that is involved is the suspension of the switch unit at the correct level and the coupling of the cables.

MULTI-MOTOR CONTROL CENTRES

Multi-motor control centres designed to enable a series of motors of different horse-powers, ranging from fractional to 400 h.p., to be started from some convenient central point by means of centralised contactors, control wiring and interlocking devices have been announced by the ENGLISH ELEC-TRIC Co., LTD., English Electric House, Strand, London, W.C.2. In a typical control centre the smaller horse-power starters (up to 25 h.p.) are mounted in banks on compartment doors to form separate "swing out" units, while medium horse-power starters (up to 100 h.p.) are mounted in "draw out" chassis compartments. The larger horse-power and more complex starters are mounted in fixed panels. The only external links necessary from control centre to motors are the power carrying cables.

The isolator for the swing-out control unit is mounted on the door and the starter is fed from "Red Spot" fuses connected to the risers and located in the rear of the compartment. Auxiliary relays can be incorporated for sequencing schemes and the necessary auxiliary contacts included on the isolator. In the drawout control units the main three-pole isolator is rated at 140 A (100 h.p.) and provision is made to rupture the current of the associated stalled motor. Special drives, such as rotor resistance starters, star-delta starters and autotransformer starters and the larger horse-power drives are accommodated in the fixed panel control centres.







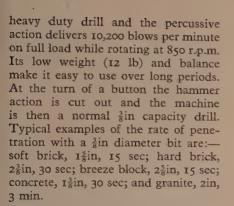
Above left: G.E.C. fluorescent fitting for stores

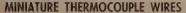
Above right: Industrial Pumps float switch

Left: Wolf "Rotopunch" rotary percussion drill

ROTARY PERCUSSION DRILL

The latest addition to the range of products made by WOLF ELECTRIC TOOLS, LTD., Pioneer Works, Hanger Lane, London, W.5, is the "Rotopunch," claimed to employ a new technique for drilling clean holes in all types of constructional materials, including granite. The tool has been developed from the model WD3c





The range of "Thermocoax" miniature thermocouple wires has now been extended by the addition of two new and smaller sizes with outside diameters of 0.34 mm and 0.25 mm. They are of "Chromel-Alumel" in stainless steel sheaths, and are available in limited continuous lengths of up to 6 metres. Type numbers are 2ABACO34 and 2ABACO25 respectively. Supplies can be obtained from the sole distributors in the United Kingdom, RESEARCH & CONTROL INSTRUMENTS, LTD., 207, King's Cross Road, London, W.C.1.

HIGH VOLTAGE SILICON RECTIFIERS

Modular silicon high voltage rectifier columns capable of delivering up to I kW/cu in have been announced by the International Rectifier Co. (Great Britain), Ltd., Hurst Green, Oxted, Surrey. These rectifier columns are available for voltages ranging from 10 to 120 kV, with current capacities from 1 to 50 A. The basic rectifier column module is a polyester glass board containing two rectifier cells, voltage dividing circuitry, connectors and heat dissipating shield.

Considerable design study has been made to ensure equal voltage sharing of the diodes. Relative positions of all component parts are equal and capacitance to ground and series inductances are kept low and equal throughout the chain. Internal voltage division by the ladder principle, using capacitors and resistors, establishes firm potential levels for all electrical and mechanical parts. Columns are equipped with shaped end shields



International Rectifier high voltage silicon unit

designed to prevent cell failure at either end of the column due to excessive ground capacitances. Complete rectifier columns may be operated in air, or in gaseous or liquid coolants, as required.

RADIANT HEATER

The "Slimline" radiant heater which has just been introduced by the Heating and Welding Department of ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Trafford Park, Manchester, 17, is available in 1, 2 or 3 kW loadings

of an installation. The respective prices are £4 8s, £6 ros 6d and £8 4s. An element guard is an optional extra and this has been designed in unit form to suit all three sizes of heater.

TELEPHONE ANSWERING MACHINE

An automatic telephone answering machine made by GATE ELECTRONICS, LTD., Hemel Hempstead, can be fitted to a switchboard or a single internal or external telephone to provide a continuous telephone answering service. A switch transfers it from an internal to an external line.

When operating as a telephone answering machine, "Proxy" delivers a pre-recorded statement of up to 35 sec duration to the caller inviting him to leave a message which is recorded on tape. The instrument will continue to record until the caller replaces his telephone receiver. It has a recording capacity of up to three hours. A red light on the control panel indicates when a message has been received. The tapes can be played back for transcription on the machine itself or detached for use on a separate unit. The G.P.O. regula-



A.E.I. "Slimline" radiant heater

and is suitable for a wide range of industrial and commercial applications. The body of the heater is of extruded aluminium section, highly resistant to atmospheric corrosion. It measures 3½ in wide by 1½ in deep and the length varies according to the loading—1 kW, 39in; 2 kW, 70in; and 3 kW, 102in. The reflector, of aluminium, is parabolic in shape and gives a beam angle of approximately 50°.

The heater, supplied complete with adjustable brackets, can be mounted direct to a wall or ceiling or can be suspended from rod, wire or chain with either vertical or angled beam, or suspended from conduit or lighting trunking. The heaters can be mounted in pairs and the company supplies a special leaflet to assist in the planning

tions are such that it can only be rented, the charge including maintenance being 31s 6d a week for a seven-year contract, 35s for a five-year contract, and 40s for three years. Installation costs £7 10s.

LAMINATED PLASTIC SHEETS

The full range of industrial laminated plastic sheets manufactured by Skanska Attikfabriken AB, Sweden, are now available in the United Kingdom from Perstorp Products (Great Britain), Ltd., High Street, Orpington, Kent. The range covers both paper and fabric based types, the former being supplied with copper cladding if required for printed circuit manufacture. Grades are available

manufactured to B.S. specification and also DIN (German) and NEMA (North American) standards. A comprehensive technical data booklet is available giving full details of this product.

CAPACITY OPERATED SWITCH

Counting is one application of the capacity operated switch recently announced by the Electronic MACHINE Co., LTD., Mayday Road, Thornton Heath, Surrey. This gives an output voltage pulse for small changes in input capacity of the order of 0.07 pF. The output from a sensing valve is differentiated and coupled to a switching valve which is normally biased to cut-off. With a sudden capacity change a pulse appears at the switching valve grid, sufficient to make the valve conduct, when it gives a voltage of 100 V across a 10 kΩ load in the anode circuit. The operating speed is from 5 to 12,000 pulses/min, but since the pulse width is small a high speed counter must be used. The counter should be for d.c. operation and have a coil resistance of 10 k Ω .

TILES FOR ILLUMINATED CEILINGS

An addition is announced by HARRIS & SHELDON ELECTRICAL, LTD., 31, Stafford Street, Birmingham, 4, to their "Paragrid - Tile" injection moulded polystyrene ceiling system. This now includes 24in square as well as 16in tiles. The new tiles will be known as "Paragrid 24" while the old size is designated "Paragrid 16." The size of the louvre cells and method of suspension remain the same but the introduction of the 2ft square tile will ensure greater flexibility of design. The number of suspension points for each 8ft length of "U-trax" is reduced from six to four.

ELECTRIC BAKING OVENS

A new range of electric baking ovens to be known as the "Loughborough" series are now being manufactured by ESSARD, LTD., Salisbury Street, Loughborough, Leics. The ovens are built in unit form of one, two or three decks, each deck to take two baking trays each measuring 30 by 18in, and they can be added to as the need arises. The special features embodied include heavy insulation for conservation of heat and a neat and clean appearance. External surfaces are finished in hardwearing enamel in a two-colour combination of light grey and white. The handle-bar for the drop-down door, which forms a shelf to ease the loading of the oven chamber, and other fittings are of stainless alloy and chromium plate.

The ovens are heated by independent top and bottom elements, thermostatically controlled; thus it is possible to vary the heat at either top or bottom of the oven chamber between a range of 200 and 550°F. The control panel includes the thermostatic controls, a "mains on" indicator, and a light signal which indicates when the



An Essard "Loughborough" single oven mounted on a plinth incorporating an electric proving cupboard and tray rack



Morphy-Richards "Solway" 2 kW coaleffect fire

required temperatures have been reached. In addition there is a damper or steam control.

The ovens are rated at 7.5 kW and are available for single- or three-phase supply.

CLOTHES DRYERS

A new clothes dryer, the "Modeq Minor," has been added to the range manufactured by the Modern Equipment Co., Ltd., Court Ash, Yeovil, Somerset. The clothes rack, manufactured in plain beech, has approximately 28ft of clothes drying space and chains are fitted to make it self-standing. The detachable convector heater base into which the rack is

fitted has a 1 kW black heat element and incorporates a thermal cut-out. The finish is in silver blue and red and the price of the complete unit is £7 9s 6d including purchase tax. A cover is also available price 19s 11d extra.

The company also announces that its larger model, the "Modeq Major" will in future be fitted with cream plastic coated clothes racks. The price,



" Modeq Minor" clothes dryer

including purchase tax, is £12 19s 5d and the hotplate tray for this model has been increased in price to £2 9s 5d including tax.

COAL EFFECT FIRE

The latest heating appliance to be introduced by Morphy - Richards (Cray), Ltd., 50, Conduit Street, London, W.I, is the "Solway," a 2 kW coal effect radiant fire. The first deliveries will be available from the beginning of June. The two I kW elements each have separate switches enabling the coal effect to operate without the radiant section. The coal effect is fitted with a diffuser and lit by a 60 W amber lamp. The finish is in pearl grey or charcoal with the fireback in flame red and the reflector and the overall fire-guard are chromium plated.

The fire, which will be listed as the SOL/20, is 22in high by 20in wide by 11in deep and will be available in two a.c./d.c. voltage ranges, 200/220 and 230/250. It is provided with 6ft of braided flex which can be fitted to either the right- or left-hand side, and holes in the base enable it to be screwed to the floor as a permanent fixture if preferred. The price is £10 138 6d, plus £1 188 6d purchase tax.

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

13369. Johnson & Phillips, Ltd., and Harris, D. J.—Cable sheaths. 1st August, 1957. (864513.)

18343/4. Simplex Electric Co., Ltd.—Electric heaters of the panel type. 14th June, 1957. (864559/60.)

19201. Electric & Musical Industries, Ltd. television. 13th June, Colour

21053. Associated Electrical Industries, Ltd.—Luminescent materials, 5th July, 1957. (864343.)

21072. Colvern, Ltd., and Collinson, R. F—Variable resistors or potentiometers. 7th October, 1957. (864344.)

21603. Richardsons, Westgarth & Co., Ltd.—Gas turbine installations. 10th July, 1957. (Cognate applications 24435, 9th August, 1956, and 26947, 3rd September, 1956.) (864526.)

22937. Automatic Telephone & Electric Co., Ltd., and British Telecommunications Research, Ltd.—Telephone systems. 3rd July, 1957. (864412.)

Elliott Bros. (London), Ltd.-Method of manufacturing a member by an electro-forming process. 16th July, 1957.

United Kingdom Atomic Energy

Authority.—Production of deuterium enriched compounds. 22nd July, 1957. (864768.)

25801/2. E.R.A. Patents, Ltd.—Electric cells of the hydrogen-oxygen type. 21st August and 19th September, 1957. (864456/7.)

26038. English Electric Co., Ltd.—Access valves for pressure vessels. 20th August, 1957. (864458.)

27255. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 9th August, 1957. (864413.)

28021. Associated Electrical Industries, Ltd.—Control systems for electric motors. 13th September, 1957. (864755.)

32269. Fairfield Shipbuilding & Engineering Co., Ltd., and Foster Wheeler, Ltd.—Steam power installations. 11th July, 1957. (864527.)

35905. Pye, Ltd.—Junction transistors. 18th November, 1957. (864771.)

37284. Brown, Ltd., S. G., Ring, R. H., and Ibbotson, T. D.—Protective arrangements for polyphase electrical apparatus. 16th September, 1957. (864459.)

1344. Laurence, Scott & Electromotors, Ltd., and Mossay, P. R.—Totally enclosed electric motors. 14th January, 1958. (864670.)
4111. A.E.I.-Hotpoint, Ltd.—Terminal structure for a sheathed electric conductor.

6th February, 1958. (864460.)

6932. Unidare, Ltd., and Greer, P. H.— Electrically heated floors, walls, ceilings and the like. 1st April, 1957. (864655.)

9878. Associated Electrical Industries, Ltd.—Arrangements for controlling the access of a number of equipments to a common apparatus. 25th February, 1958. (864340.)

11018. Philips Electrical Industries, Ltd.—Transistor amplifier circuit arrangements. 4th April, 1957. (864515.)

1088. Yardney International Corporation.—Silver/zinc electric cell or battery. 4th April, 1957. (864347.)

14800. W.H.R. Developments, Ltd.—Fluid-pressure electric switches. 7th August, 1864327.)

1957. (864327.)

15742. English Electric Co., Ltd.—Induction motors. 19th May, 1958. (864644.) 19134. Communications Patents, Ltd.— ired broadcasting systems. 18th June, Wired broadcas 1957. (864773.)

21589. General Electric Co., Ltd.— Speed-governing systems. 4th July, 1958. (864533.)

Associated Electrical Industries Electrical storage arrangements, 16th July, 1958. (864359.)

25027. Government of the Netherlands,

Circuit arrangements composed of transistor stages. 8th August, 1957. (864794.)
25178. Walther & Cie. A.G.—Reactors for performing nuclear fission reactions. 9th August, 1957. (864379.)

Standard Telephones & Cables. Ltd.—Automatic synchronisation equipment. 9th August, 1957. (864415.)

27138. A. Reyrolle & Co., Ltd.—High voltage multi-break air-blast circuit-breakers. 28th November, 1958. (864835.)

27341. Sony Kabushiki Kaisha.—Method electrolytically etching the surface of an py-type germanium junction transistor. 30th August, 1957. (864621.)

28296. Ericsson Telephones, Ltd.— Electromagnetic coils and method of forming them. 4th September, 1958. (864836.)

31189. I-T-E Circuit-Breaker Co.-Stress elief cone for electric cable terminations. 4th

October, 1957. (864426.)
32061. British Broadcasting Corporation Electrical phase shifting networks. 19th September, 1958. (864708.)

33081/2. Westinghouse Electric Corporation.—Transistors. 23rd October, 1957. (864837/8.)

33217. Miller, J. D.—Printed board. 24th October, 1957. (864479.) D .-- Printed circuit

33760. General Electric Co., I Clamping arrangements for electrical ductors. 27th October, 1958. (864673.)

35236. Philips Electrical Industries, —Cathode-ray tubes or colour television. 12th November, 1957. (864796.)

35645. Fernseh G.m.b.H.—Control arrangements for synchronising impulse generators. 15th November, 1957. (864417.)

1356. Associated Electrical
Ltd.—Electrical plug-in type contact pins.
14th January, 1959. (864657.) 14th January, 1959. (864657.) 2315. Usines Chausson,

Electromagnetic frequency tuned reciprocating motor. 23rd January, 1958. (864516.) 9325. General Electric Co., Ltd.—Driving

arrangements. 24th March, 1959. (864419.) 14902. Standard Telephones & Cables Ltd.—Armouring for submarine cables. May, 1959. (864842.)

20835. A. V. Roe & Co., Ltd.—Electrical counting. 16th June, 1959. (864462.)
21092. General Electric Co., Ltd.—

Electric heating elements. 30th June, 1959. (864318.)

Rauland Corporation.-Manufac-23989. ture of cathode-ray tubes. 25th July, 1958. (864464.)

25502. Western Electric Co., Inc.—Methods of producing silicon bodies. 8th August, 1958. (864705.)

Associated Electrical Industries, 26345. Associated Electrical Add.—Selector systems. 4th August, 1959. Ltď.-(864637.)

General Electric Co., Ltd.-26476. cookers. 17th August, 1959. Domestic (864816.)

Wagner Electric Corporation.—control system. 19th August, 26613. Electrical 1958. (864408.)

28334. British Telecommunications arch, Ltd.—Electrical signalling systems. 17th August, 1959. (864442.)

31180. Vyzkumny a Zkusebni Letecky Ustav.—Electromagnetic circuit for measur-

ing or indicating change of magnetic flux. 30th September, 1958. (864660.)

31841. Longworth Scientific Instrument o., Ltd.—Rechargeable electric battery. 17th September, 1959. (864844.)

32290. Associated Electrical Industries, Ltd.—Electrical connections. 15th Septem-

ber, 1959. (864584.)
33940. General Electric Co., Ltd., Cole,
W. P., and McKee, G. M.—Manufacture of
printed electric circuits. 20th October, 1959.

34432. of and t Fordham Pressings, Ltd.of and means for fixing electric heaters to kettles made of thermoplastic materials. 7th September, 1959. (864363.)

Westinghouse Electric Corporation, Magnetic amplifiers. 11th November, 1958. (863932.)

38115. Kablo Kladno, Narodni Podnik.— Cable termination. 26th November, 1958. (864152.)

Sylvania Electric Products, 39166. Electron tube. 4th December, 1958. (864321.) 39184. Associated Electrical Industries, Ltd.—Semiconductor rectifiers. 3rd Decem-

ber, 1959. (864004.)
39616. F. C. Blackwell & Co., Ltd.—
Terminals or connecting means for electrical cables and wires. 8th October, 1959. (864153.)

40783. General Electric Co.—Rotors of dynamo-electric machines. 17th December, 1958. (863921.)

International Resistance Co. Metal film resistor and method of making same. 19th December, 1958. (863882.)

41314. General Electric Co., Ltd., and Doughty, D. C.—Devices having non-reciprocal transmission characteristics. 22nd December, 1959. (863960.)
41830. Shields, R. (Edcliff Instruments, Inc.).—Variable resistors. 29th December, 1958. (863973.)

222. Lucas, P. M., and Sautel, A.—Remote line concentrators in telephone systems. 2nd January, 1959. (864985.)

638. Tesla, Narodni Podnik.—Electric map-action switch for potentiometers and the like. 7th January, 1959. (863923.)

643. Elektrotechnicke Zavody Julia Fucika, n.p. Brno.—Liquid blast electric circuit-breaker. 7th January, 1959. (865280.) 1841. Clevite Corporation.—Piezo-electric

phonograph pickup. 19th January, 1959. (863889.) 1966. Sylvania-Thorn Colour Television Laboratories, Ltd.—Television picture display devices. 15th January, 1960. (864233.)

2284. A.E.I. Lamp & Lighting Co., Ltd.-Electric discharge lamps. 21st January, 1959. (864234.)

4078. Detectron, Inc.—Apparatus for detecting defects in dielectric material. 5th February, 1959. (864785.)

884. Sealectro Corporation.—Coupling coaxial cables. 12th February, 1959. 4884.

(863753.) Westinghouse Electric Corporation, —Thermistors. 23rd February, 1959. (864845.)

General Motors Corporation.-Refrigerator. 11th March, 1959. (864574.)

Pacific Scientific Co.—Compenator for a control cable. 19th March, 1959. (863977.)

13389. Westinghouse Electric Corporation.—Protective systems for a.c. generators. 20th April, 1959. (863770.)

Accumulatoren-Fabrik Process for the treatment of formed negative electrodes of lead accumulators. 22nd April, 1959. (864592.)

15164. Patelhold Patentverwertungs & Elektro-Holding A.G.—Signal discriminator circuit arrangements. 4th May, 1959. (864713.)

16023. Brooke, W., and Howe, H.—Electric remote control devices. 11th May, 1959.

20355. Allmänna Svenska Elektriska A.B.—Electrical insulation for high voltage conductors. 15th June, 1959. (864719.)

21359. Sonotone Corporation.—Gas vent closure for electric storage batteries. 22nd June, 1959. (864827.)

21528. Bendix Corporation.—Process and apparatus for winding field coils. 23rd June, 1959. (864603.)

21696. Compagnie Française Thomson-Houston.—Transistor amplifier circuit. 24th June, 1959. (864806.)

21844. Siemens & Halske A.G.-Electron beam generating assemblies. 25th June, 1959. (864215.)

22360. Greenshields, J. B.—Electrostatic separation apparatus. 30th June, 1959.

22373. Specialpopper A.B.—Device for regulating the average effect of electric heating apparatus. 30th June, 1959. (864828.)

Inreco A.B.—Electric switching 22481. Inreco A.B.—Electric devices. 30th June, 1959. (864337.)

22621. Svenska Aktiebolaget G lator.—Voltage divider of high power. 15th July, 1958. (863591.) Svenska Aktiebolaget Gasaccumu-

23376. Engen, G. F.—Self-balancing d.c. colometer bridges. 7th July, 1959. (863935.) 23936. Daystrom, Inc.—Variable resistance device. 13th July, 1959. (864217.)

25169/70. Giambertoni, A.—Electrically operated floor polishers. 22nd July, 1959. (864218 and 864687.)

25631. Westinghouse Electric Corporation.—Protection of rotating electrical devices, 27th July, 1959. (864639.)

27095. Siemens-Schuckertwerke A.G.—Controllable rectifier arrangements for supplying a d.c. consumer circuit. 7th August, (864219.)

28214/5. American Radiator & Standard Sanitary Corporation.—Refrigerating systems, 18th August, 1959. (863955 and 863964.)

31040. Standard Telephones & Cables, Ltd.—Electric power cables, 11th September, 1959. (864832.)

Gendron Frères S.A.-Electric 31046. motors and portable machine tools embodying them. 11th September, 1959. (864649.)

Ferranti, Ltd.—Data apparatus. 14th September, 1959. (864744.)

31283. Central Electricity Generating Board, Crosse, P. A. E., Snowsill, W. L., and Lucas, D. H.—Apparatus for measuring a property of gas-borne dust or of a gas stream carrying dust. 25th May, 1959. (Divided out of 864071.) (864072.)

31586. Vorkauf, H.-Installation to utilise waste heat from Siemens-Martin open-hearth furnaces or the like for generating steam. 16th September, 1959. (864368.)

Siemens-Schuckertwerke A.G. 32519. Selliens-Schuckertwerke A.G.— Enclosed surface cooled pole changing squirrel cage motor arrangements for driving ships' winches or the like. 24th September, 1959. (864449.)

33214 Siemens & Halske A.G.—Electric discharge tubes. 30th September, 1959. (864303.)

35108. Fuji Denki Seizo Kabushiki Kaisha.—Electrostatic precipitator arrangements. 16th October, 1959. (864338.)

35305. United Kingdom Atomic Energy Authority.—Fuel elements for gas cooled nuclear reactors. 6th October, 1959. (863335.)

35338. Goodrich Co., B. F.—Electromagnetic motor. 19th October, 1959. (864162.)

36225. Siemens & Halske A.G.—Transistor circuit arrangements. 11th November, 1958. (863336.)

36972. General Electric Co., Ltd.— Transistor oscillators. 11th November, 1959.

37029. Stern, W. L.—Electric circuit supervising devices. 21st October, 1959. (863337.)

37049. Simon-Carves, Ltd.—Anchoring means for wire cables. 2nd November, 1959. (864170.)

38027. Automatic Telephone & Electric Co., Ltd.—Mounting arrangements for electrical components. 28th October, 1959.

(863633.)
40582. Engel & Gibbs, Ltd.—Electrical control elements affected by tilting. 27th October, 1959. (863289.)

Transistor electrical invertor systems. 17th December, 1958. (863658.)

42032. Philips Electrical Industries, Ltd.
-Bi-stable trigger circuits. 10th December, 1959. (863791.)

42045. Griffiths Electronics, Inc.-Electron gun construction. 10th December, 1959. (864850.)

Western Electric Co. 42416. Travelling wave tubes. 14th December, 1959. (863672.)

97. Hobart Manufacturing Co.—Dish washing machines. 1st January, 1960. (863301.)

229. Philips Electrical Industries, Ltd.— Low power transformers. 4th January, 1960.

Ross, R. S., and Matthews, C. H. C. —Stable circuit for direct visual reading of temperatures. 11th January, 1960. (863896.)

895. General Electric Co.—Luminescent screen settling. 11th January, 1960. (863965.)

1407. Siemens-Schuckertwerke A.G.—Process for providing a semiconductor body with a metal electrode. 14th January, 1960.

Ohio Crankshaft Co.-High frequency inductors. 6th June, 1958. (863142.)

32864. Raytheon Co.—Means for mounting an electro-acoustical transducer. 27th March, 1957. (Divided out of 863809.)

36782. Siemens-Schuckertwerke A.G.—Semiconductor devices. 25th April, 1957. (Divided out of 864120.) (864121.)

38339. A.E.I.-Hotpoint, Ltd.—Terminal structure for a sheathed electric conductor. 6th February, 1958. (Divided out of 864460.) (864461.)

41178. Unidare, Ltd., and Greer, P. H.—Electrically heated floors, walls, ceilings and the like. 1st April, 1957. (Divided out of and addition to 864655.) (864656.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 5th May.

gogo. No. B794,486. Class 7. Domestic electric machines for mixing, pulping, beating and grinding food.—Address for service; Stanley, Popplewell, Francis & Ross, 9-11, Cursitor Street, Chancery Lane, London, E.C.4.

Polymatic. No. 813,970. Class 7. Washing, drying and wringing machines; mixing, dough kneading, vegetable cutting, potato peeling, potato scraping and electric floor polishing machines; and hair drying machines.

—Polymatic Domestic Appliances, Ltd., Cater Buildings, Cater Street, Bradford.

Transtat. No. 799,422. Class 9. Temperature regulators incorporating transistors.—Control Instruments, Ltd., Birkenhead Works, Sandford Street, Birkenhead.

Stearns Magman. No. 803,806. Class 7 Magnetic separators and magnetic pulleys and drums. Also No. 803,807. Class 9. Magnets.—Indiana General Corporation, U.S.A. Address for service: Lloyd Wise, Bouly & Haig. 10, New Court, Lincoln's Inn, London W.C.2

Revox. No. 801,318. Class 9. Electrical apparatus for recording and reproducing sound.—W. Studer, Zurich, Switzerland. Address for service: J. A. Kemp & Co., 14, South Square, Gray's Inn, London, W.C.I.

Qoilmax. No. 804,983. Class 9. Radio frequency and intermediate frequency components, all incorporating conductors.—
"Electroniques" (Felixstowe), Ltd., Radio Works, Bridge Road, Felixstowe.

Wotan, No. 807,039. Class 9. Wotan. No. 807,039. Class 9. Scientific and electrical apparatus and instruments, not including batteries. No. 807,040. Class 10. Lamps for medical purposes.—Osram G.m.b.H., Munich, Germany. Address for service: Cruikshank & Fairweather, 29, Southampton Buildings, Chancery Lane, London, W.C.2.

Pressmatic. No. 806,678. Class 9. Television apparatus and instruments.—A.B. Metal Products, Ltd., Walkden House, Melton Street, Euston Square, London, N.W.I.

Condulet. No. 812,279. Class 9. Electric conduit material.—Crouse-Hinds Co., Syracuse, U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

Venn-o-Fone, No. 810,920. Class 9. Devices used in conjunction with telephones for timing the duration of calls.—Venner, Ltd., Kingston By-Pass, New Malden, Surrey.

Babette. No. 812,101. Class 9. Sound amplifying and reproducing apparatus, incorporating transistors, for use as baby alarms.—J. A. Chapman, trading as J.C. Acoustics, 61, Wolseley Road, Wealdstone, Harrow.

Agromat. No. 813,311. Class 10. Scientific apparatus for utilising the emanations from radioactive sources.—Nuclear Engineering, Ltd., Sutton Lane, Langley, near Slough, Bucks.

Veriflux. No. 813,389. Class 9. Electromagnetic flow measuring instruments and parts.—Alto Instruments (Great Britain), Ltd., London Road, Brimscombe, Stroud, Glos.

No. 812,262. Class Sound amplifying and reproducing apparatus and instruments.—Technipoint, Ltd., 133, Euston Road, London, N.W.I.

Polaris. No. 807,548. All goods included in Class 11.—Thorn Electrical Industries, Ltd., Thorn House, Upper St. Martin's Lane, London, W.C.2.

Newlec. No. 811,004. All goods in Class 11, except refrigerators.—Newey & Eyre, Ltd., 102, Hagley Road, Edgbaston, Birm-

Street Lighting Plans

Thornaby-on-Tees (Yorks.) Town Council has approved in principle a £30,000 scheme for converting the town's remaining gas lights to electricity. The work is likely to be carried out during 1961-62.

Ashington (Northumberland) U.D.C. is to spend £2,600 improving street lighting in Third and Fourth Avenues.

Stockton-on-Tees Town Council has approved the relighting of heavily trafficked classified roads in the town.

Redcar Town Council, which has spent during the past few years, is planning to carry out work costing another £10,000 during the coming municipal year.

Lymington Borough Council is seeking Ministry approval of an £11,450 loan for a major scheme of Class "B" lighting in the New Milton and Barton-on-Sea area.



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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 17th APRIL

MONDAY, 17th APRIL

Bath.—Royal York Hotel, 8 p.m. A.S.E.E.
Bristol and West of England Branch. "Electricity in Printing," by B. I. O'Donnell.

Birmingham.—Grand Hotel. Birmingham
Electric Club. "Ceramics for the Electrical
Industry," by E. C. Williams.

Brighton.—Technical College, 6.30 p.m.
I.E.E. Southern Centre. "Progress in OilFilled Cables and their Accessories," by A. N.
Arman, F. J. Miranda and G. R. Bishop; and
"The Influence of Ageing on the Characteristics of Oil-Filled Cable Dielectrics," by
P. Gazzana-Priaroggia, G. L. Palandri and
U. Pelagatti.

Bristol.—University, Royal Fort, 7.30 p.m.
Society of Instrument Technology, Bristol
Section. Annual general meeting followed by
film show.

film show.

Gridiner, Sons & Co. Showroom. I.E.S. Bath and Bristol Centre. Annual general meeting and film show.

Cardiff.—South Wales Institute of Engineers, 6 p.m. I.E.E. Western Centre Supply Group. "The Operation of Large Electrical Supply Systems," by L. B. Law.

Glasgow.—Royal College of Science and Technology, 6 p.m. I.E.E. Glasgow Electronics and Measurement Group. Annual general meeting and "Hydraulics v. Electrics," by D. Firth.

Ipswich.—Electric House, 7.15 p.m. Ipswich and District Electrical Association. "The Future of Television in Britain," by T. A. H. Marshall.

Leeds.—British Lighting Council, 24, Aire

T. A. H. Marshall.

Leeds.—British Lighting Council, 24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "The Artistic Use of Lighting in Multi-Camera Technique," by H. E. H. Mayhew.

London.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal discussion: "The Education of Engineers—All's Well?", to be opened by the President, Sir Hamish MacLaren.

Northampton College of Technology, St.

Sir Hamish MacLaren.
Northampton College of Technology, St.
John Street, E.C.I, 6.15 p.m. Institute of
Metal Finishing. "Plating of Zinc-Based
Die-Castings," by J. Edwards.
Newcastle-on-Tyne.—Royal Station Hotel,
6.30 p.m. I.E.E. North Eastern Centre.
Annual general meeting and conversazione.
Stone.—Duncan Hall, 7 p.m. I.E.E. North
Staffordshire Sub-Centre. "The Potentialities
of Artificial Earth Satellites for Radiocommunication," by W. J. Bray.

MONDAY, 17th to SATURDAY, 22nd APRIL

Sutton Bonington,-E.D.A. Rural Electrification Conference.

TUESDAY, 18th APRIL

Birmingham.-James Watt Memorial Insti-Birmingham.—James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Institute of Metal Finishing, Midland Branch. Discussion: "How much Polishing is Needed?", to be opened by M. A. Price.

Bristol.—Royal Hotel, 7.30 p.m. Institute of Metal Finishing, South West Branch. Annual general meeting and film show.

Cardiff.—South Wales Institute of Engineers, 7 p.m. I.E.E. Cardiff Graduate and Student Section. Annual general meeting followed by "The Engineer as Manager," by J. E. Cule.

Edinburgh.—Carlton Hotel, North Bridge,

J.E. Cule.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. "Radiocommunication in the Power Industry," by E. H. Cox and R. E. Martin.

Farnborough.—Technical College, Boundary Road, 6.15 p.m. I.E.E. Southern Centre. Joint meeting with the Royal Aeronautical Society. "The Future of 'Electros' and 'Electronics' in Aircraft and Guided Missiles," by Viscount Caldecote.

Leeds.—Leeds and County Conservative Club, South Parade, 6.30 p.m. I.E.E. North Midland Centre Utilisation Group. "The

Application of Irradiation in Industry," by M. C. Crowley-Milling.

Liverpool.—Merseyside and North Wales Electricity Board, Paradise Street, 6 p.m. I.E.S. Liverpool Centre. Annual general

London.—I.E.E. Lecture Theatre, Savoy Place, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. Discussion: "Aspects of the Design of Electrical Installation Materials and Equipment." Panel: Messrs. D. E. Bird, R. H. Phillips, C. A. M. Thornton and C. J. Veness. The meeting is open to non-member engineers and technicians. technicians.

technicians.

10, Chesterfield Street, Mayfair, W.1,
7.15 p.m. Institution of Production Engineers, London Graduate Section. Lecturettes.

Oxford.—Employment Exchange, 8 p.m.
A.S.E.E. Oxford and Districts Branch.

"Fault Tracing in Electrical Apparatus."

Sittingbourne.—Coniston Hotel, 7.30 p.m.
A.S.E.E. West Kent Branch. "Fire Fighting," by H. E. Evans.

TUESDAY, 18th and WEDNESDAY, 19th APRIL.

Swansea.—Brangwyn Hall. Conference on "Science and Industry—The Problem of Communication," organised by the Department of Scientific and Industrial Research.

TUESDAY, 18th to FRIDAY, 21st APRIL

Harrogate.—E.D.A./E.A.W. Demonstrators' Conference.

WEDNESDAY, 19th APRIL

Birmingham.—Midland Hotel, 7 p.m. Institution of Production Engineers, Midlands Region. "International Competition in Machine Tool Design and Production," by R. Asquith.

Bristol.—School of Management Studies, Unity Street, 7 p.m. British Institution of Radio Engineers, South Western Section. "Colour Television," by G. N. Patchett. Cheltenham.—Belle Vue Hotel, 7.30 p.m. Society of Instrument Technology, Chelten-ham Section. Annual meeting and presidential

ham Section. Annual meeting and presidential address "Instrumentation Developments in the Petroleum Industry," by G. C. Eltenton.

Liverpool.—Adelphi Hotel, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "The History of Radio," by G. R. M. Garratt.

Section. "The G. R. M. Garratt.

London.—Savoy Place, W.C.2, 5.30 p.m.
I.E.E. Supply Section. "Progress in Oil-Filled Cables and their Accessories," by A. N. Arman, F. J. Miranda and G. R. Bishop; and "The Influence of Ageing on the Characteristics of Oil-Filled Cable Dielectric," by P. Gazzana-Priaroggia, G. L. Palandri and U. A. Pelagatti.

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U. A. Pelagatti.

Manson House, 26, Portland Place, W. I, 6.15 p.m. Society of Instrument Technology, Data Processing Section. Annual general meeting, followed by "Electronic Telephone Exchanges," by T. H. Flowers.

Manchester.—College of Science and Technology, Reynolds Hall, 6.15 p.m. I.E.E. North Western Centre Electronics and Communications Group Meeting. "Channelling—A Sketch," by T. B. D. Terroni.

Newcastle-upon-Tyne.—Roadway House, Oxford Street, 7 p.m. Society of Instrument Technology, Newcastle Section. "The Design, Application and Selection of Automatic Control Valves," by P. Stone.

Peterborough.—Conference Room, Peters-

Peterborough.—Conference Room, Peterscourt, 7.30 p.m. Institution of Production Engineers, North Midlands Region. Film

Rochester.—King's Head Hotel, High Street, 7 p.m. Institution of Plant Engineers, Kent Branch. "Plastic Bearings," by J. F. L. Ludgate.

Scunthorpe.—North Lindsey Technical College, 6.30 p.m. I.E.E. Sheffield Sub-

"Silicon Power Rectifiers," by A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams.

- Lanchester Southampton. — Lanchester Buildings, University of Southampton, 7 p.m. British Institution of Radio Engineers, Southern Section. "The Development of an Ammonia Maser Oscillator as a Frequency Standard," by A. Mitchell.

Wolverhampton.—Chamber of Commerce, District Bank Chambers, Lichfield Street, 7-45 p.m. A.S.E.E. Wolverhampton and District Branch. "Resistance Welding," by H. Shurlev.

H. Shurley.

THURSDAY, 20th APRIL

Blackburn.—Castle Hotel, 7.30 p.m. Institution of Plant Engineers, Blackburn Branch. "The Application of New Materials to Plant Engineering," by J. Leyland.
Cambridge.—Cavendish Laboratory, 8 p.m. I.E.B. Cambridge Electronics and Measurement Group. "The Potentialities of Artificial Earth Satellites for Radiocommunication," by W. I. Brav.

W. J. Bray.

London.—Savoy Hotel, 12.15 for 1 p.m.
Gauge and Tool Makers' Association.

Gauge and Tool Makers' Association. Luncheon.

Savoy Place, W.C.2, 6 p.m. Institution of Electrical Engineers. Joint meeting with Graduate and Student Section. "Aluminium in Electrical Engineering," by P. J. H. Rata; "Diesel Railway Locomotives," by A. D. Swanston and B. W. Towell; and "Automatic Programming for Hot Reversing Mills," by V. E. S. Rickard.

Royal Commonwealth Society, 7 p.m. Institution of Production Engineers, South Eastern Region. "High Speed Cinematography in Production," by J. Hadland.

Loughborough.—College of Further Education, Greenclose Lane, 6.45 for 7.15 p.m. Society of Instrument Technology, East Midland Section. Annual general meeting followed by presidential address.

Portsmouth.—College of Technology, 6.30 p.m. I.E.E. Southern Graduate and Student Section. Annual meeting followed by a film and discussion on "The Construction of an Atomic Power Station—Hinkley Point."

THURSDAY, 20th and FRIDAY, 21st

London.—Institution of Electrical Engineers, Savoy Place, W.C.2. Convention on "Television and Film Techniques," jointly sponsored by the British Kinematograph Society and the Television Society.

FRIDAY, 21st APRIL

FRIDAY, 21st APRIL

Birmingham.—College of Technology,
Gosta Green, 7 p.m. Institution of Electronics, Birmingham Branch. "Long-Distance
Communication by Circular Wave Guide," by
F. J. D. Taylor.

Cheltenham.—North Gloucestershire Technical College, 7 p.m. British Institution of
Radio Engineers, South Midlands Section.
Annual general meeting followed by "The
Mesa Transistor and its H.F. Applications,"
by D. H. Mehrtens.

Mesa Transistor and its H.F. Applications," by D. H. Mehrtens.

Coventry.—Leofric Hotel. I.E.E. Rugby Sub-Centre. Rugby Engineers' Ball.

London.—Large Lecture Theatre, London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.I, 7 p.m. Institution of Electronics. "Modern Transistors and their Applications," by T. D.

St. Albans,—Waterend Barn. Electrical Industries Benevolent Association, Northmet Branch. Dinner-dance.

FRIDAY, 21st to SUNDAY, 23rd APRIL

Bournemouth.—Linden Hall Hotel. Institution of Works Managers. First International Conference.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—N.S.W. Electricity Commission. 15th May. Motor-generator sets and other equipment for Vales Point power station. (E.S.B. 11842/61.)*
Sydney County Council. 4th May. Switchgear. (E.S.B. 11843/61.)*

Burma.—Rangoon Electric Supply Department. 15th May. Circuit-breakers. (E.S.B. 11823/61.)*

Bury.—Corporation, 18th April, Class "A" street lighting, 25th April, Sodium, fluorescent and tungsten lamps for Corporation departments during 1961-62. (See this

-Corporation, 4th May. Coventry.-

and electrical accessories during year ended 30th June, 1962. (See this issue.)

Dagenham.—Corporation. 28th April. Electrical installation in new transport workshops. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. 275 kV transmission line. (See this issue.)

India.—Bihar State Electricity Board. 4th July. Four 5 MW generating sets for Kosi East Canal hydro-electric power station. (E.S.B. 11432/61.)*

(E.S.B. 11432/61.)*
Rajasthan State Electricity Board, Jaipur. 26th April. Switchgear. (E.S.B. 11406/61.)*
Stores Purchase Committee, Bangalore. 28th April. Control panels, m.g. sets, etc., for Sharavathi Valley hydro-electric project. (E.S.B. 11444/61.)*
India Supply Mission, Washington, D.C. 12th June. 138 kV circuit-breakers for Chandrapura power station. (E.S.B. 11429/61/D.L.F.)*
Puniab State Electricity Board.

Punjab State Electricity Board. 23rd May. Circuit-breakers. (E.S.B. 11197/61.)* 5th June. Surge divertors. (E.S.B. 11198/61.)* 15th and 23rd June. Metering equipment. (E.S.B. 11401/61.)*

Iraq.—Ports Administration, Basrah. 23rd April. Fluorescent fittings. (E.S.B. 10473/61.)* 30th April. Lighting fittings. (E.S.B. 10472/61.)*

Ministry of Oil, 25th April. Electrical equipment. (E.S.B. 10474/61.)*
Ministry of Defence, Baghdad. 26th April. Telephone sets. (E.S.B. 8175/61.)*

Italy.—N.A.T.O. Infrastructure Contract. 26th May. Fourteen telephone switchboards (Contract No. 9960). Applications to tender by 26th April. (G.D. 1318/60(102).)†

Korea.—Government Office of Supply, Seoul. 4th May. Transformers, switchgear, etc. (E.S.B. 11427/61/I.C.A.)*

Manchester.—City Council, 2nd May. Sodium lanterns and traction pole bracket sleeves. (See this issue.)

New Zealand.—G.P.O., Wellington. 18th May. Potentiometers. (E.S.B. 11155/61.)*
25th May. Cable. (E.S.B. 11487/61.)*
State Electricity Department, Wellington. 18th July. 1,385 transmission line towers. (E.S.B. 10890/61.)*

Nigeria.—Electricity Corporation of Nigeria. 19th July. 132 kV transmission line. (E.S.B. 11484/61.)*

* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given. †Telephone: Trafalgar 8855,

Northern Ireland.—Tyrone County Council. 5th May. Electrical installation in new county headquarters at Omagh. McCandless & consulting engineers, 6, Murray Barton, consu Street, Belfast.

Pakistan.—Department of Supply and Development, Karachi. 1st May. Two 218 kVA diesel-engine generating sets. (E.S.B. 10892/61/D.L.F.)* 2nd May. 66 kV transmission lines. (E.S.B. 10863/61/D.L.F.)* 9th May. 132/66/11 kV substation at Multan, West Pakistan. (E.S.B. 10864/61/D.L.F.)* P.W. Railway, Lahore. 29th April. Electric lamps. (E.S.B. 11851/61.)*

Rhodesia and Nyasaland.—Bulawayo Electricity Department. 3rd May. Transformers. (E.S.B. 11486/61.)*

Rewiring of

Scunthorpe.—Corporation. Rewiring of 238 pre-war houses. (See this issue.)

South Africa.—Union Tender Board, Pretoria. 24th April. Cable. (E.S.B. 10834/61.)* Telephone switchboards. (E.S.B. 10839/61.)*

South Vietnam. — Central Purchasing uthority, Saigon. 26th April. Insulators Insulators Authority. and switchgear. (E.S.B. 11151-2/61.)*

Thailand. — Metropolitan Authority. 10th May. Conductor. 11495/61.)*

United States.—Bureau of Reclamation, 25th April. 15 MVA transformer. (E.S.B. 11193/61.)* 26th April. Substation equipment. (E.S.B. 11436/61.)*

Willesden.—Borough Council. 9th Ma Street lighting installation. (See this issue.)

Winchester.—City Council. 21st April. Street lighting, Worthy Road, High Street and Worthy Lane. (See this issue.)

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aylesbury.—Extension of nurses' home, Royal Bucks. Hospital; Ballard & Bleese, architects, 34, St. Giles Street, Oxford.

Bristol.—Youth centre, Withywood (£36,000), extensions to Cotham Grammar School (£35,000), and 11-storey flats; city engineer, Cabot House, Deanery Road.

Burnley.—Central omnibus station, Pickup Croft (£128,000); borough engineer, Nicholas

Chester.—Bishop's School (£200,000); ouglas, Munshull & Co., architects, 6, Douglas, Mur Abbey Square.

Doncaster.—Works extension Firth, Ltd., Armthorpe Road. Houses (263); R.D.C. surveyor. extensions;

Durham.—C. of E. primary school, Ebchester; F. M. Owsnett, consulting engineer, Lloyds Bank Chambers, Fawcett Street, Sunderland

Exeter.—Reconstruction and extension of garage, Honiton Road; Blue Star Garages, Ltd., 35, Hampstead High Street, London, N.W.3.

Farnworth.-Dwellings (85), Plodder Lane area: borough architect.

Gateshead.—Nursery school, Grove (£15,000); borough engineer.

Halifax.—First stage of Victoria Hall evelopment scheme (£59,000); borough engineer, Crossley Street.

Harlow.—Shopping centre, health centre, library and other buildings, Staple Tye, Great

Parndon; general manager to Development Corporation, Terlings, Harlow, Essex.

Hertford.—Fire and ambulance station, divisional and brigade headquarters, London Road (£193,000); county architect, County Hall, Hertford.

Hexham.—Houses (40), Causey Hill; U.D.C. surveyor.

school (£80,000); county architect, Shire Hall, Llangefni. Holyhead.—Extensions to comprehensive

Hull.—Bungalows (56), Pickering Road; McManus & Co., Ltd., Mimms Hall Road, Potters Bar, Middx.

Kempston (Bedfordshire).--Extensions rinsbury), Ltd., Chantry Avenue; Fords (Finsbury), Ltd., Chantry Avenue.

Proposed new engineering factory; Ashdown Bros. & Co. (Engineers), Ltd., Chantry

Avenue.

Kenton.—Office block; British Building Supplies, Ltd., Plough Corner.

(60); Kiveton Park.—Houses Lidgett Lane, Dinnington, Rotherham.

Leicester.—Occupational therapy department, Carlton Hayes Hospital, Narborough; Pick, Everard, Keay & Gimson, architects, 6,

Liverpool.—Redevelopment scheme, St. John's Market area (arcade, shops, market, hotel, etc.); Ravenseft Properties, Ltd., 52, Charles Street, London, W.1.

London.—Flats and maisonnettes (54), Lansdowne Lane, Charlton, S.E.7; G. C. Turk, town clerk, Town Hall, Greenwich,

S.E.10.
Office block, Greystoke Place; Trollope & Colls, Ltd., 1, Noble Street, E.C.2.
Factory, Osborn Street, Stepney; Carnegie Models, Ltd., 23, Eastcastle Street, W.I.
Luton.—Secondary school at Toddington (£131,650); county architect, Shire Hall, Bedford.

Middlesbrough.—Extensions to Constantine Technical College (£800,000); Alison & Hutchison, architects, 4, Rothsay Terrace,

Edinburgh, 3.

Houses (41), St. Hilda housing estate;
J. A. Kenyon, borough engineer.

Middlesex.—Central clinic at Plevna Road, Edmonton (£45,800); county architect, 1, Queen Anne's Gate Buildings, London,

Old Fletton.—Houses (76); Ruddle & Wilkinson, architects for scheme, Long Causeway Chambers, Peterborough.

Plymouth.—Factory, Whitleigh estate; C. & J. Clark, Ltd., Street, Som.

Seaham.—Supermarket, Church Street; Boyer & Partners, architects, 88, Gray's Inn Road, London, W.C.I.

Sheffield.—Theatre, Western Bank, for University; Gollins, Melvin, Ward & Partners, architects, 281, Glossop Road, Shef-

St. Albans.—Central library, Civic Centre site; city surveyor, 16, St. Peter's Street.

Sunderland.—Business premises at The Parade for Thomas Reed & Co., printers and publishers, 184, High Street West.

Thorne (Yorks.).—Proposed supermarket (£200,000); Doncaster Co-operative Society,

Council offices (£60,000); R.D.C. surveyor. Uxbridge.—Flats (36), Leybourne Road, Hillingdon; borough engineer.

Watford.—Extensions to Central Library; borough engineer, Town Hall.

Wath-on-Dearne.—Mineral water factory; John Smith's (Tadcaster) Brewery, Ltd., High Street, Tadcaster.

Wythall.—Secondary school; S. T. Walker & Partners, architects, 9, Frederick Road, Edgbaston, Birmingham.

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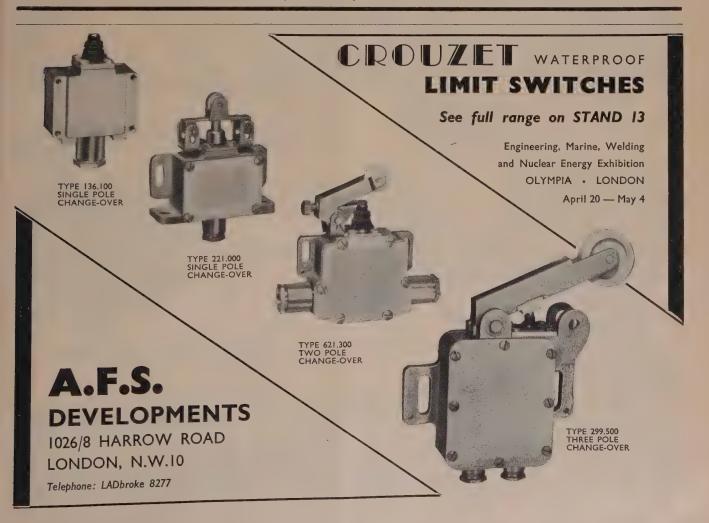
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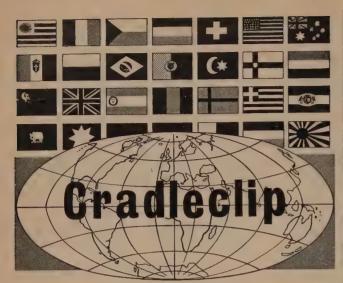
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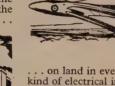




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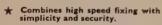


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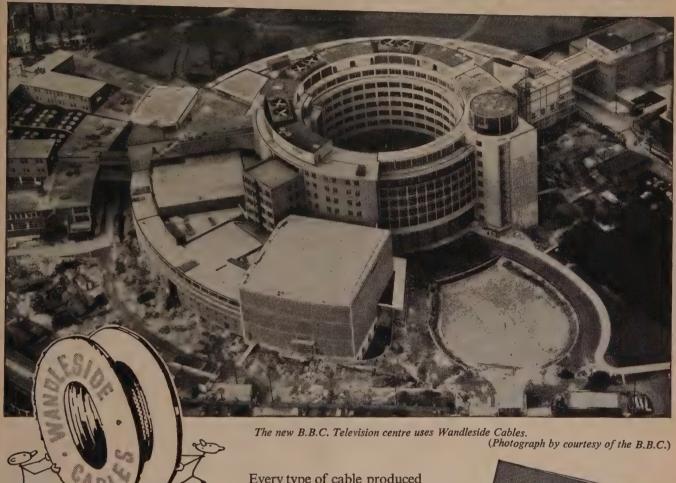
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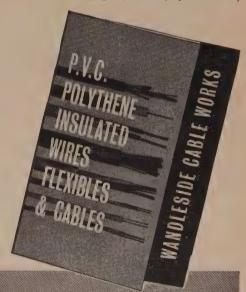
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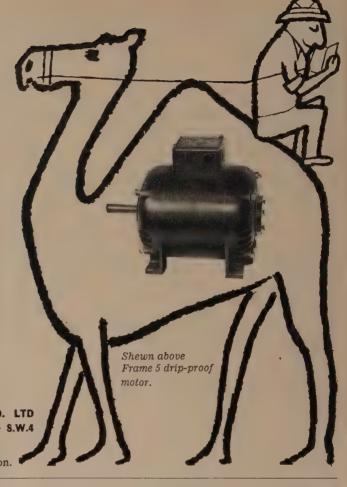


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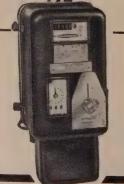


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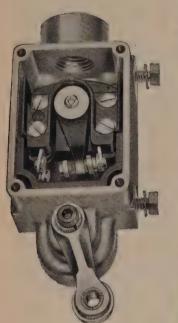
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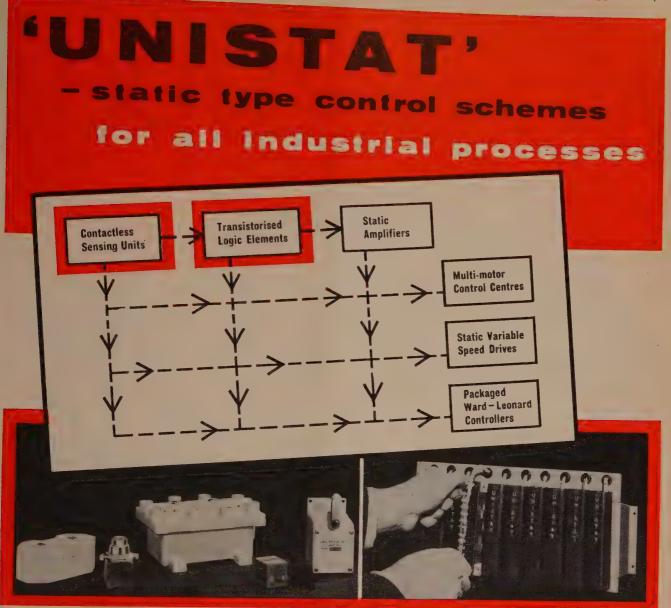
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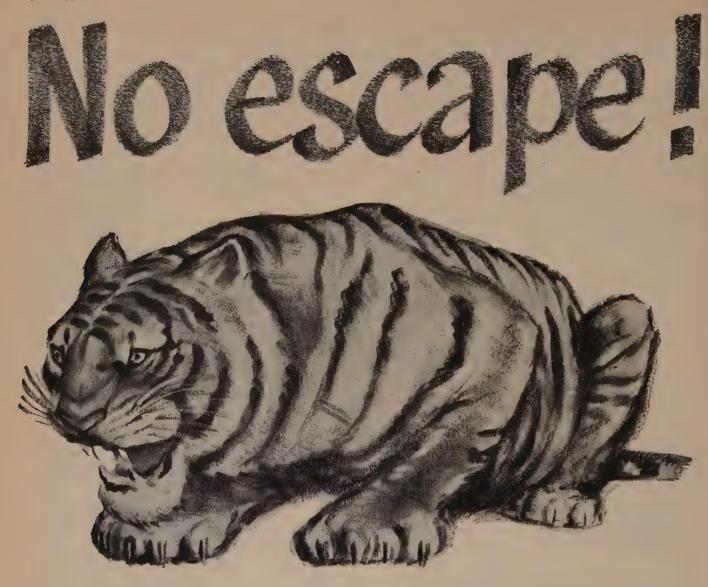
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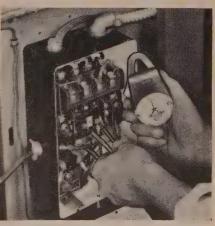
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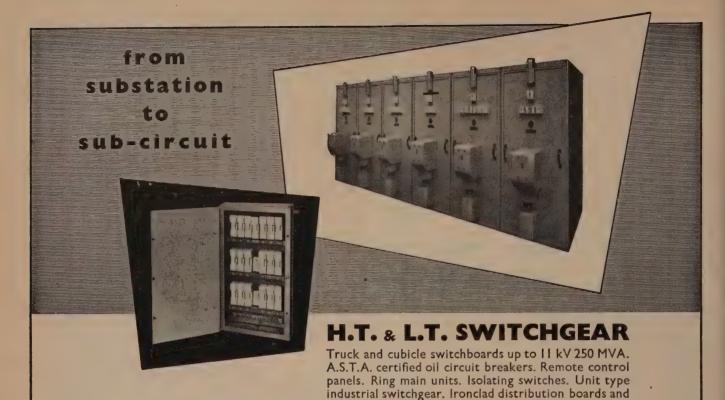
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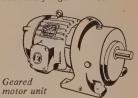
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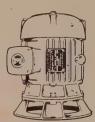


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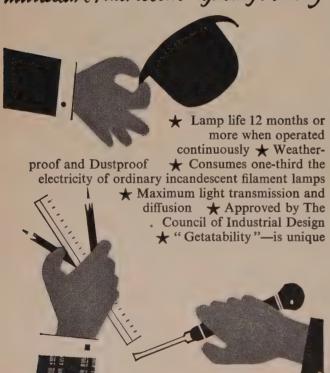
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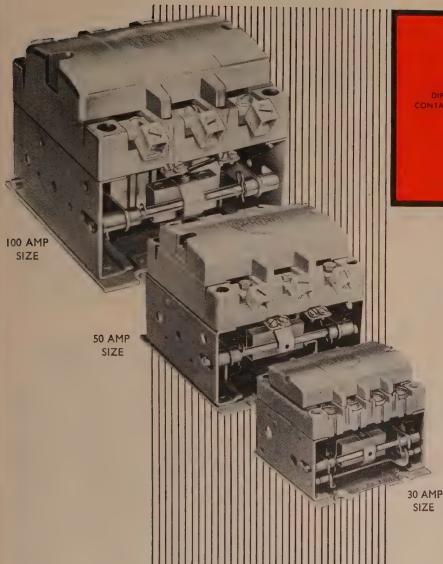


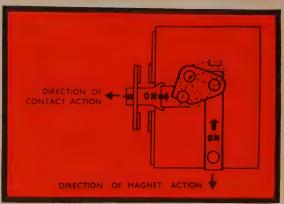


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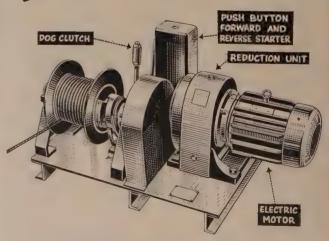
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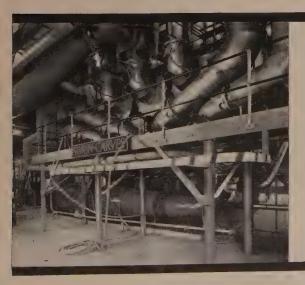
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Telephone: Lymington 3267 (2 lines)

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Clifton Hall, Oakley Road, Shirley, Southampton
Telephone 73867 & 76056

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For all electrical contracting installations, lighting, heating, power, public address, etc.

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Andrews Building, 67 Queen Street, Cardiff I

Telephone 29639

Also at: Leeds, Ilkley, London, Manchester, Sheffield, Bristol and Scunthorpe

(Continued from page 88)

CLARKE BROS. (Stroud) LTD. High Street, Merchyr Tydfil
Telephone: Merthyr Tydfil 3377
Electrical Engineers and Contractors
Rewinds and Repairs. Industrial Installations

W. J. FURSE & CO. (MANCHESTER) LTD. Royal Buildings, Talbot Road, Port Talbot

Telephone: Port Talbot 3276
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HIGGINS & CATTLE LTD.

322 India Buildings, Water Street, Liverpool 2

Telephone: Liverpool Central 1729
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Electrical Engineers and Contractors
SOUTHERN & REDFERN LTD.
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ANGLO-AMERICAN ELECTRICAL COMPANY Olive St., Bury, Lancs.

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Electrical Installations: Power, Heating, Lighting.
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STEWART THOMSON & SONS (Liverpool) LTD.
Fort Road, Seaforth, Liverpool 21
Repairs and Rewinds A.C. and D.C. to 3,000 horsepower.
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DRAKE & GORHAM (Contractors) LTD. 21 Newton Street, Piccadilly, Manchester I Telephone: Manchester Central 4701

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DENton 3961

Electronic Maintenance Grosvenor Street, Manchester ARDwick 5011

ethin to Hagge and Matthewall Miller (19 1800) Re-

W. J. FURSE & CO. (MANCHESTER) LTD. 20 Mount Street, Manchester 2

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Britain's largest Electrical Installation Organisation for all high-class Electrical
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COX-WALKERS LTD.
North Eastern Electric Works, Feethams, Darlington
Electrical Contractors of repute since 1880. Motor Rewinds and Manufacturing
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CITY ELECTRICAL CO. Turks Head Yard, Cecil Street, Lincoln Telephone: Lincoln 124 London: HOLborn 9722

NORTH OF ENGLAND ENGINEERING & ELECTRICAL CO. LTD. Ferryhill 86 Ryhope Rd. Sunderland Palladium Buildings Co. Durham Middlesbrough Tel: 435/6 Tel: 58762 Tel: 8815 ELECTRICAL INSTALLATION CONTRACTORS

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Britain's Largest Electrical Installation Organisation for all high-class Electrical
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Talabhare: Central 6424

Glasgow, C.3

Telephone: Central 3866

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Electrical Engineering Contractor

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THE

ADVERTISEMENT DEPARTMENT ELECTRICAL REVIEW

STAMFORD STREET DORSET HOUSE LONDON S.E.I

ACRU NEON INDICATOR LAMPS



Used by most Electronic and Electrical Manufacturers throughout the world. Supplied with one-hole fixing. Average life 25,000 hours. There are over twenty-five models. Voltages from 60 to 440.

Ask for details of our new S.E.S. and M.C.C. fittings.

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MORTGAGES AVAILABLE FOR MAXIMUM PRIVATE HOUSE PURCHASE

Please telephone HOLborn 0567 or send us your requirements giving details of the purchase price, age of property, district, maximum deposit available, date of birth, number of dependants, gross income, office telephone number and mention ELECTRICAL REVIEW

Please address your correspondence to The Secretary, P.S.H.F.A., 333 High Holborn, London, W.C.I



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Dust-free ventilation and cooling of motors and electrical equipment in heavy industries is achieved most efficiently and economically by CYCLONE Fans and Equipment. 'Phone or write for full details.



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Head Office and Works: Cyclone Works, Swinton, Manchester Cyclone Works, Swifton, Malichester Tel: SWInton 2273 (4 lines) London Office: 135 Rye Lane, Peckham, London S.E. 15. Tel: NEW Cross 6571 (4 lines) Also at: Glasgow - Leeds - Birmingham Cardiff · Bournemouth



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THE COMBINATION of road and air transport, running to regular schedules, offers you speedy and reliable services between reception points throughout Great Britain and the Continent.

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Roadair services operate between LONDON and

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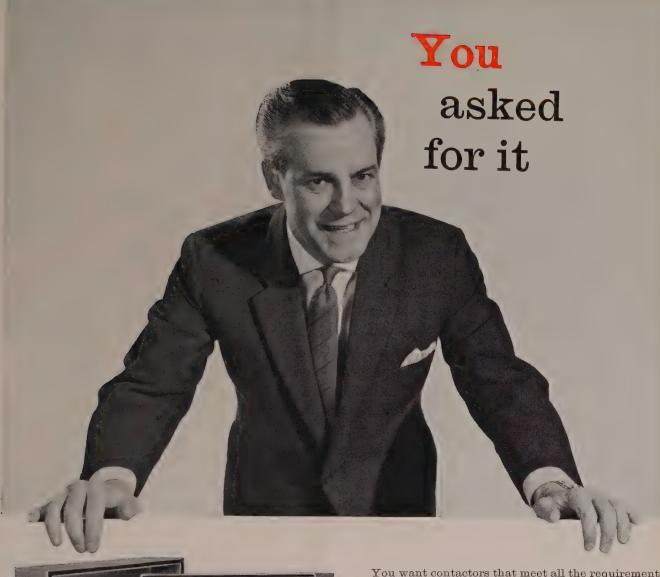
With connecting services to and from Manchester, Leicester, Nottingham and Brighton

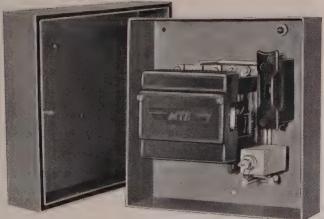


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For full specification and information on available extras and user experience, you should write now for M.T.E. Heating Contactor Leaflets.

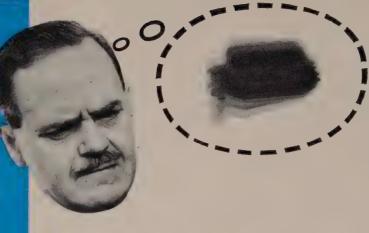
You want contactors that meet all the requirements of electrical heating circuits and M.T.E. have developed just that. Customer experience, built up over the years, has proved the dependability of M.T.E. contactors—now this special development is being produced to simplify the selection and installation of contactors for heating control.

Covering the range from 15 to 150 amps, M.T.E. Heating Contactors are available in single, double and triple-pole form, all contacts are fully protected by an arc barrier and cover in Alkyd moulding. Compact, heavy duty, unit constructed M.T.E contactors are silent in operation and fully comply with BSS.775 (1956). Front access and front wiring make for easy installation, whilst sheet steel dust and damp protecting enclosures incorporate knock-out conduit entries at top and bottom.



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Siemens Ediswan 4-way, 4-wire use or Link Disconnecting Box

Just think of the equipment with the



name

behind it!

Distribution pillars and panels-Underground disconnecting boxes, branch boxes, service boxes and straight-through joints-Indoor and outdoor terminal boxes-Indoor and outdoor service fuses - H.T. and super-tension joints and sealing ends -Overhead service accessories - Rising mains systems - House service fuses and consumers' control units -Jointing materials and accessories of every description.



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ROTUNDA INSULATING TAPES

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MANUSCREENED BY MANCHESTER

'Highly Efficient Electrical and Protective Tapes'

These Rotunda Insulating Tapes may be used individually and also in combination where protective and corrosion resistance is required. Insulate (low or medium voltages) with Pure Rubber Strip or Rubber Splicing Compound Tape, and give outer protective lappings of Black Adhesive Insulating Tape or Pitch & Bitumen Tape (for abrasion resistance) or P.V.C. Plastic Adhesive Tape (for toughness and resistance to weather, and some degree of resistance to chemicals, oils and solvents). For higher voltages, and where resistance to ozone is required, insulate with Polythene Self-Amalgamating Tape and give outer protection as above, according to choice. Write for full details of these Rotunda Products. Manufactured by ROTUNDA LIMITED, DENTON, MANCHESTER POLYTHENE BASED



MINIBUS M k. III

SELF-AMALGAMATING

MINIATURE BUSBAR DISTRIBUTION SYSTEM WITH 'UNIBLOK'ISOLATION PAT. PENDING

The E.M.S. Miniature Busbar system provides flexible power distribution for Machine Shops, Laboratories, Test Bays, Tool Rooms and all

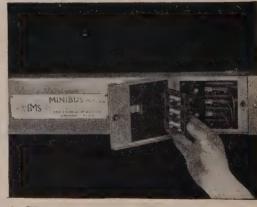
flexible power supply applications.

Special features of the E.M.S. Minibus Mk. III distribution system includes immediate isolation of appliances, rapid connection and disconnection of equipment with absolute safety, no separate fuse units, cartridge fuses only being required; easy erection and relocation together with clean design and smart appearance.

Feed points for incoming mains cables are supplied in separate units in 100 amps and 200 amps sizes and both these units are for attachment to a length of trunking, and may be used as end feeds (100 amps) or centre feeds (200

The total loading on the E.M.S. Minibus Busbar system is 100 amps per phase on 400/440 volt supplies, with a maximum machine loading on 30 amps per phase. Further details of the E.M.S. Minibus Mk. III Busbar system

can be obtained from



An Efficient Mobile and Safe Distribution System.



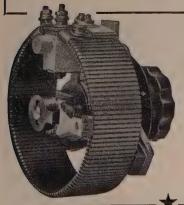
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PRODUCTS



a range of extremely robust

ROTARY RHEOSTATS



Open or enclosed types
100 watts
150 watts
200 watts
Larger sizes quoted on
request

An extremely robust rheostat with a unique metal cored former (patent appd. for)

Full details from the manufacturers

The CURTIS S

Manufacturing Company Limited

26-28 PADDENSWICK ROAD HAMMERSMITH, W.6

Telephone: RIV. 4456 and 4583



E.D.L. INDUSTRIES LTD., Redbrook Lane, Brereton, Rugeley, Staffs
Telephone: Rugeley 711





- THE COPPER BONDING LINK IS 1 x 1 in CROSS SECTION AND CAN BE ADAPTED TO TAKE A SCREW TERMINAL FOR AN EXTRA EARTH WIRE IF REQUIRED
- EXTRA SLOTS ARE PROVIDED IN THE TRUNKING BODY TO FACILITATE LID FIXING SHOULD THE TRUNKING NEED CUTTING
- ACCESSORIES ARE DESIGNED WITH RADIUSED SURFACES TO PREVENT CABLES BEING DAMAGED BY SHARP ANGULAR EDGES
- DETACHABLE CABLE RETAINING STRAPS
- ALL NUTS AND BOLTS ARE CADMIUM OR ZINC PLATED
- ALL COMPONENTS OF THE SYSTEM ARE FINISHED IN OVEN-BAKED ENAMEL (ADMIRALTY GREY)
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- ALL CONNECTING SLEEVES ARE INTERNALLY FITTED TO GIVE A SMOOTH EXTERNAL APPEARANCE

ALSO AVAILABLE—CABLEFLOW SKIRTING TRUNKING TO YOUR SPECIFICATIONS EMBODYING SWITCH PANELS, PLUGS, ETC. PRICES UPON APPLICATION

PRICES GIVEN ON REQUEST FOR SPECIAL ACCESSORIES, NON-STANDARD CROSS SECTIONS, PIN RACKS, EXTRA LONG CONNECTING SLEEVES AND PARTITIONING FILLETS, BUS BAR CHAMBERS.

SEND THIS COUPON FOR FULL DETAILS AND PRICES TO:— CABLEFLOW LTD., FACTORY UNIT 4A FIRCROFT WAY, EDENBRIDGE, KENT.
NAME
ADDRESS.
F D 1



Palamit units are for use where the advantages of MEKELITE units have to be sacrificed to the consideration of low first cost. The difference in price is due to the simplified design and not to lower standards of material and workmanship.

Various arm lengths (max. horizontal reach 39 in.). Five sizes of reflector. Seven types of base. Full particulars on request.

MEK-ELEK Eng. Ltd., Western Rd, Mitcham, Surrey Phone: MiTcham 1072 Cables: Makelek Londo



THE PRECISION & MFG. CO. LTD.

UNION ST. WILLENHALL

PHONE: WILLENHALL 621

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CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

DISPLAYED CLASSIFIED: -53/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.I. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

COUNTY BOROUGH OF BURY

Class "A" Street Lighting

TENDERS invited for :-

- (a) Supply of 61 Steel or Concrete Columns, 30 ft, to light source, together with 200-watt Sodium Lanterns, Lamps, Control Gear and Timeswitches.
 - (b) Erection and installation of above.
 - (c) Removal of 120 existing traction type standards, overhead lines, etc.

standards, overhead lines, etc.

The above tenders are for stage 1 of a six-year programme for the replacement and modernisation of street lighting installations on main traffic routes. The six-year programme provides for the supply and erection of approximately 700 new lighting columns and equipment, and the removal of approximately 900 existing traction type standards and equipment. Further particulars, forms of tender, etc., from Street Lighting Superintendent, Street Lighting Department, Hacking Street, Bury.

Tenders enclosed in a plain sealed envelope endorsed "Tender, Street Lighting," must reach me not later than 18th April, 1961.

EDWARD S. SMITH,

EDWARD S. SMITH, Town Clerk. Town Hall, Bury.

29th March, 1961.

BOROUGH OF WILLESDEN

Street Lighting

TENDERS are invited from experienced Contractors for the following work in the Borough :-

- (a) Supply only 15 140-watt and 261 60-watt Sodium Lighting Units and ancillary equipment.
- (b) Supply and erection of 15 25-ft. mounting height Concrete Columns and 261 15-ft. mounting height Concrete or Steel Columns, wiring and fixing of lanterns and ancillary equipment.

Contract documents may be obtained from the Borough Engineer and Surveyor, Town Hall, Dyne Road, Kilburn, London, N.W.6. Deposit of two guineas for either or both tenders, refunded on receipt of a bona fide tender not subsequently withdrawn.

Sealed tenders must be delivered to the undersigned not later than 10 a.m. on Tuesday, 9th May, 1961.

R. S. FORSTER.

R. S. FORSTER, Town Clerk. 574

BOROUGH OF SCUNTHORPE

Electrical Re-Wiring to Modern Standards of 238 Pre-War Council Houses, Crosby Estate

TENDERS are invited from approved Elec-trical Installation Contractors to carry out the above work.

the above work.

Forms of tender and specification may be obtained from the Housing Manager, Housing Department, Lincoln Gardens, Scunthorpe.

Sealed tenders must be received by the Town Clerk, Municipal Offices, 34, High Street, Scunthorpe, in the envelope provided, not later than noon on the 27th April, 1961.

It is a provision of the contract that the successful tenderer(s) will be required to enter into a bond. The Corporation do not bind themselves to accept the lowest or any tender.

CITY OF WINCHESTER

Street Lighting

Worthy Road, Hyde Street (A.3090) and Worthy Lane (B.3045)

TENDERS are invited for the ERECTION

Tenders are invited for the ERECTION complete of approximately 49 LIGHTING POINTS involving 25-tt. Steel Columns for 250-watt colour corrected Mercury Lighting. Specification, bill of quantities and form of tender may be obtained from the City Engineer and Surveyor, Guildhall, Winchester, at whose office plans may be inspected. A deposit of £2 2s. will be required but will be refunded on receipt of a bona fide tender.

Tenders in a plain envelope endorsed "WORTHY ROAD LIGHTING" should be addressed to the undersigned not later than first post on FRIDAY, 21st APRIL, 1961.

R. H. McCALL,

R. H. McCALL Guildhall, Winchester. 29th March, 1961. Town Clerk.

COUNTY BOROUGH OF BURY

Supply of Lamps

TENDERS are invited for supply of Lamps for all Corporation Departments during 1961/2. Sodium, Fluorescent and Tungsten Lamps will be required.

Further particulars and form of tender from treet Lighting Superintendent, Street Lighting Department, Hacking Street, Bury.

Tenders enclosed in a plain sealed envelope endorsed "Tender for Supply of Lamps" must reach me not later than 25th April, 1961.

EDWARD S. SMITH.

EDWARD S. SMITH, ry. Town Clerk. Town Hall, Bury. 6th April, 1961.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

275-kV Transmission Line

TENDERS are invited for the construction of a 275-kV Double Circuit Steel Tower Line, approximately 54 miles route length, between Cruachan and Windyhill, in the counties of Argyll, Perth, Dunbarton and Stirling.

Tender documents may be obtained on application with deposit of £2 2s. (returnable) to the Engineers, Messrs. Merz & McLellan, 72a, George Street, Edinburgh, 2. The Board do not bind themselves to accept the lowest or any tender.

BOROUGH OF DAGENHAM

Electrical Installation, New Transport Workshops

NENDERS are invited from members of the

N.I.C.E.I.C. for this sub-contract. Forms of tender (obtainable from the Borough Engineer and Surveyor) must be returned to me in the envelopes provided by noon on 28th April, 1961.

KEITH LAUDER, Town Clerk.

Civic Centre, Dagenham.

COVENTRY CORPORATION

invite tenders for supply of following materials during year ending 30th June, 1962:—

SCHEDULE 8: Electric Lamps and Electrical Accessories.

Forms of tender from City Engineer, Council House, Coventry. Completed tenders by 12 noon, 4th May. 635

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW Dorset House, Stamford Street London, S.E.I

Original testimonials should not be sent with applications for employment

. CITY OF MANCHESTER

TENDERS are invited for the supply of :-(a) 1,000 85-watt totally enclosed Sodium Lanterns complete with auxiliary equipment in the hood.

(b) 650 Traction Pole Bracket Sleeves.

Tender forms, returnable by 2nd May, 1961, from the City Surveyor, Town Hall, Manchester, 2.

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

EAST MIDLANDS ELECTRICITY BOARD

Nottingham Sub-Area

FOURTH ASSISTANT ENGINEER

(Construction)
(Vacancy No. 39/61).
Salary N.J.B. Class K, Grade 13, £890 to £1,015 per annum.
Applications are invited from suitably qualified and experienced engineers for the above

vacancy.

The successful applicant will be required to assist with construction work associated with 33-kV and 11-kV schemes (substations, underground cables and overhead lines) from the planning stage to commissioning, using either direct or contract labour. Ability to drive a car is desirable.

car is desirable.

SECOND ASSISTANT DISTRICT
ENGINEERS
(Vacancy No. 40/61).
Salary N.J.B. Class G, Grade 7, £1,115 to
£1,245 per annum, and N.J.B. Class F, Grade 7,
£1,040 to £1,165 per annum.
The duties will include construction, maintenance and operation on distribution systems of all voltages up to and including 33 kV.
Ability fo drive a car is essential and the successful applicant will be required to undertake standby duty.
Applications for the above vacancies should be forwarded to the Manager, Nottingham Sub-Area, 35/39, Carrington Street, Nottingham within fourteen days of the date of this advertisement.

567

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

A SSISTANT ENGINEER (Instruments) reservice conditions, superannuable appointment, salary within Schedule A, Class L, Grade 9, £1,275-£1,410 per annum.

The successful applicant will be required to assist the Instrument Engineer in the maintenance of all instruments and automatic controls, and should have extensive experience of modern power station instrumentation and automatic boiler control. Experience of telemetering systems and a good working knowledge of electronics desirable. Applicants should possess a Higher National Certificate in Electrical Engineering or its equivalent.

Apply, quoting Vacancy No. 97/61M.D., on form AE,6, available from the Station Superintendent, Rugeley Power Station, Rugeley, Staffs., to whom it should be returned when completed by 24th April, 1961.

by 24th April, 1961.

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

SSISTANT COAL AND ASH A SSISTANT COAL TIME

HANDLING ENGINEER,

NOTTINGHAM POWER STATION (Vacancy No. 72/61).

Applications are invited for the position of Assistant Coal and Ash Handling Engineer at Nottingham Power Station, Queens

Candidates should have knowledge of the operation of coal, ash and dust handling plant at a large modern power station, and of the organisation and planning of coal supplies by road and rail.

The duties of the successful applicant will include the organisation of ash disposal by lorry

transport.

Salary will be in accordance with Class K,
Grade 10 (£1,115 - £1,245 per annum) of the
National Joint Board Agreement.

Closing date for receipt of applications, 21st

April, 1961.

ASSISTANT EFFICIENCY ENGINEER, NOTTINGHAM POWER STATION (Vacancy No. 73/61).

Applications are invited for the position of Assistant Efficiency Engineer at Nottingham. Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class K, Grade 8 (£1,275 - £1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 21st April, 1961.

SECOND ASSISTANT

SECOND ASSISTANT
STATION CHEMIST,
NOTTINGHAM POWER STATION
(Vacancy No. 74/61).
Applications are invited for the position of Second Assistant Station Chemist at Nottingham

Second Assistant Station Chemist at Nottingham Power Station, Queens Drive, Nottingham.

Candidates should have had previous experience in a power station laboratory and should hold the Higher National Certificate in Chemistry. They should be familiar with the methods of sampling and analysis of coal, water and oil and with the interpretation and application of the analytical results.

Salary will be in accordance with Class K, Grade II (£1,040-£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 21st April, 1961.

ASSISTANT ENGINEERS (Relief),
NOTTINGHAM POWER STATION
(Vacancy No. 75/61).
Applications are invited for the positions of
Assistant Engineers (Relief) at Nottingham
Power Station, Queens Drive, Nottingham.

Applicants should have received a sound electrical training and have had experience of the operation and control of modern highpressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class K, Grade 12 (£965 - £1,090 per annum) of the National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 21st April, 1961.

ASSISTANT ENGINEER (Control) (Relief),
NOTTINGHAM POWER STATION
(Vacancy No. 76/61).
Applications are invited for the position of
Assistant Engineer (Control) (Relief) at Nottingham Power Station, Queens Drive, Nottingham.
Candidates for this post should be suitably
qualified and have had experience in the control
room.

room.

Salary will be in accordance with Class K, Grade 14 (£825 - £940 per annum) of the National Joint Board Agreement, plus appropriate allowance whilst engaged on shift duties.

Closing date for receipt of applications, 21st April, 1961.

ASSISTANT SHIFT CHARGE

ENGINEER, NOTTINGHAM POWER STATION

(Vacancy No. 78/61).

Applications are invited for the position of Assistant Shift Charge Engineer at Nottingham Power Station, Queens Drive, Nottingham.

Applicants should preferably possess the Higher National Certificate or its equivalent, and have had responsible experience in the operation of modern power station plant. Pulverised fuel experience will be an advantage.

Salary will be in accordance with Class K, Grade 8 (£1,275-£1,410 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 21st April, 1961.

ASSISTANT ENGINEER (Relief), STAYTHORPE "A" POWER STATION (Vacancy No. 80/61).

Applications are invited for the position of Assistant Engineer (Relief) at Staythorpe "A" Power Station, nr. Newark, Notts.

Power Station, nr. Newark, Notts.

Applicants should have received a sound electrical training and have had experience of the operation and control of modern highpressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class K, Grade 12 (£965 - £1,090) per annum) of the National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 28th

ASSISTANT ENGINEER (Operation), DRAKELOW "A" POWER STATION (Vacancy No. 81/61).

(Vacancy No. 81/61).

Applications are invited for the position of Assistant Engineer (Operation) at Drakelow "A" Power Station, near Burton-on-Trent, Staffs.

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience. Technical qualifications to Higher National standard desirable.

Salary will be in accordance with Class T

Salary will be in accordance with Class J, Grade 10 (£1,040 - £1,165 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 28th

SHIFT CHARGE ENGINEER,
BURTON-ON-TRENT POWER
STATION (Vacancy No. 82/61).
Applications are invited for the position of
Shift Charge Engineer at Burton-on-Trent
Power Station, Wetmore Road, Burton-onTrent, Staffs.

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary will be in accordance with Class E, Grade 7 (£965 - £1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 28th

ASSISTANT SHIFT CHARGE
ENGINEER, BURTON-ON-TRENT
POWER STATION
(Vacancy No. 83/61).
Applications are invited for the position of
Assistant Shift Charge Engineer at Burton-onTrent Power Station, Wetmore Road, BurtonTrent Staffs. Assistant Shift Charge Engineer at Burton-on-Trent Power Station, Wetmore Road, Burton-on-Trent, Staffs.

Applicants should possess H.N.C. or equiva-lent qualifications and have experience in power station operations

station operation.

Salary will be in accordance with Class E, Grade 9 (£825 - £940 per annum) of the National Joint Board Agreement, plus an allowance for shift duties.

Closing date for receipt of applications, 28th

April, 1961.

SECOND ASSISTANT STATION CHEMIST, HIGH MARNHAM POWER STATION (Vacancy No. 84/61).

Applications are invited for the post of Second Assistant Station Chemist at High Marnham Power Station, nr. Newark, Notts.

Candidates should be experienced in the analysis and testing of coal, oil and water, and in the application of the results to high-pressure plant. Candidates should also hold the Higher

National Certificate in Chemistry or its equivalent.

Salary and conditions of service in accordance with Class N, Grade 11 (£1,275 to £1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 28th

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned, and should be returned to him by the date stated.

o. s. woods, WOODS, Divisional Controller. 644

NORTH WESTERN ELECTRICITY BOARD

Second Assistant District Engineer Leigh District

THE duties will be to assist the District Engi-I neer in the construction, operation and maintenance of the 33 kV, 11 kV and low voltage distribution systems.

The successful applicant will be responsible for a section of the District and should be pre-

pared to undertake standby duties.

Applicants should preferably be Corporate
Members of the Institution of Electrical Engi-

Salary scale £1,275/£1,410 p.a., Grade J.7.

N.J.B. conditions.

Applications on forms to be obtained from the

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, and returned to him by 26th April, 1961.

Fourth Assistant District Engineer
Burnley District
The duties will include assistance in the operation, maintenance and construction of substations and H.V. and L.V. underground and overhead mains, fault location and the general maintenance of supply in the District. The successful applicant will be required to undertake standby duties.

staces standby duties.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £890/£1,015 p.a., Grade H.11.

N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, and returned to him by 22nd April, 1961.

SOUTH OF SCOTLAND ELECTRICITY BOARD

A PPLICATIONS are invited for the post of ASSISTANT PURCHASING OFFICER within the Purchasing Department at Board Headquarters.

The duties comprise responsibility for bulk purchase arrangements, supervision and coordination of purchases, stocks and stores disposal within the distribution areas; the purchase of supplies for 275-kV and 132-kV transmission of supplies for 275-kV and 132-kV transmission system; printing, stationery and other requirements for Board Headquarters. Candidates should have a thorough knowledge of suppliers within the electrical manufacturing industry, and possess experience in the purchasing of plant, equipment and stores for the distribution of electricity.

Salary N.J.M.C. Class C, Grade 6, £2,380/£2,595 per annum.

Applications, quoting reference No. P.1/61, should be submitted on the standard AE.6 to the Secretary, Inverlair Avenue, Glasgow, S.4, not later than 24th April, 1961.

HEAVY ELECTRICALS LTD., BHOPAL

PPLICATIONS are invited from Indian A PPLICATIONS are invited from Indian Nationals for Junior Supervisory Posts with Heavy Electricals Limited.

Scale of pay Rs.350-850 or Rs.275-800 according to suitability.

Age 25-35 years (relaxable in certain cases). Qualifications and experience:-

(i) A good diploma in mechanical or elec-

trical engineering.

(ii) At least 4-5 years' practical training/experience in a manufacturing organisation of repute.

Applicants should apply immediately for forms and detailed information to Mr. P. Scott-Roy, Technical Adviser, High Commission of India, India House, Aldwych, London, W.C.2. 597



THE BRITISH OIL AND CAKE MILLS LTD.

AN ELECTRICAL ENGINEER

IS REQUIRED FOR OUR FACTORY AT

SELBY, YORKSHIRE

The factory comprises an oilseed expelling mill, solvent extraction plant, oil refinery, and a large animal feeding-stuffs mill.

Extensive use is made of the most up-to-date electrical techniques, including remote and automatic controls. The plant is served from eight substations with a total transformer capacity of 13,550 kVA.

Applicants must be Corporate Members of the Institution of Electrical Engineers and have had adequate experience in the field of electrical engineering as applied in process industries. Candidates should preferably be in the age range 30-40.

Applications, giving age, qualifications and experience should be addressed to:

BRITISH OIL AND CAKE MILLS LTD. (AFP.T/437)

UNILEVER HOUSE, BLACKFRIARS, LONDON, E.C.4

600



CONSTRUCTION

A number of interesting vacancies have arisen with Atomic Power Constructions Limited for Construction Engineers at Head Office in London, at Trawsfynydd Nuclear Power Station in North Wales and also for future projects.

CIVIL ENGINEERS

One vacancy exists at Head Office and one at Trawsfynydd for suitably qualified Senior Civil Engineers who have had experience on the planning and/or construction of large industrial plants, preferably in the field of power generation. Less senior vacancies also exist for men with comparative experience.

Two vacancies exist at Head Office and two at Trawsfynydd for engineers who are, preferably, members of the Institution of Mechanical Engineers and have experience in the planning of large industrial plants or have worked in the field on the erection of such plants.

ELECTRICAL ENGINEERS

Two vacancies exist in the planning section at Head Office and one at Trawsfynydd for Electrical Engineers who are experienced in power station practice and also have experience of E.H.T. switch-gear and cable work.

INSTRUMENTATION AND CONTROL ENGINEERS

Qualified Electrical Engineers, who have specialised in control circuits and instrumentation, are required to work initially at Head Office transferring to Trawsfynydd Power Station during the period of commissioning and initial operation.

These positions are on the pensionable staff and carry good prospects of advancement within the Company. In all cases, experience with nuclear power will be an advantage, but training will be arranged in nuclear techniques where necessary. Good salaries will be paid and generous allowances made to those engineers working at site.

Applications should be addressed to:
The Personnel Manager (Ref. ER/169),
ATOMIC POWER CONSTRUCTIONS LIMITED
P.O. Box 90, 28 Theobalds Road, London, W.C.1

563

ELECTRIC MOTOR CONTROL GEAR DESIGN ENGINEER

required

Applicants should have had experience in the design and construction of automatic panels and hand operated gear up to 100 HP. Some electronic knowledge would be an advantage but not essential.

Position is permanent. Attractive remuneration with incentive bonus and contribu-Box No. 619. tory pension scheme.

TRUST HOUSES LIMITED

TRUST HOUSES Ltd. have a pro-I gressive programme of development involving modernisation and extension of their many existing hotels and the construction of a number of new hotels.

The Architect's Department (of which there is an Engineering Section) is being reorganised to meet this situation, and applications are invited for the following new appointments:—

- A. CHIEF ENGINEER. Salary not less than £1,750. Applicants should be University Graduates in Engineering and members of the I.E.E. or I.H.V.E. (preferably both), fully experienced in the installation and maintenance of mechanical, electrical, heating and ventilating plant in buildings.
- B. ASSISTANT ENGINEER (Heating and Ventilating). Salary in accordance with qualifications and experience. Applicants should hold, or be studying for, a technological qualification and have had some years' experience of the design and supervision of heating and ventilating in buildings.
- ng in buildings.

 C. ASSISTANT ENGINEER (Electrical). Salary in accordance with qualifications and experience. Applicants should hold, or be studying for, a technological qualification and have had some years' experience of the design and supervision of electrical installations in buildings.

 Persion and life assumes schemes.

Pension and life assurance schemes, five-day week, free lunches.

Applications, marked "Confidential," giving full particulars and stating the post applied for, should be sent to the following address not later than 24th April, 1961.

Nelson Foley, A.R.I.B.A., A.I.L.A. Chief Architect

TRUST HOUSES LTD.

53, Short's Gardens, London, W.C.2



ELECTRICAL **CONTRACTS ENGINEER**

required to act as ASSISTANT to Electrical Contracts Manager.

Candidates should be up to the age of 35 and have served a recognised apprenticeship with a reputable electrical contractor followed by at least two years' supervisory duties.

Preference will be given to candidates having a good technical education and experience of industrial and flameproof installations. Good salary and contributory pension scheme.

Please write, stating age, qualifications, experience and present salary to:—

The Personnel Manager CONSTRUCTORS JOHN BROWN LIMITED

C.J.B. House, Eastbourne Terrace Paddington, London, W.2

quoting Ref. No. K.7992

81 88

TRANSFORMERS (WATFORD) LTD.

require

TEST ENGINEER

with some experience on power and distri-bution transformers up to 33 kV. Apply:

Chief Test Engineer
TRANSFORMERS (WATFORD) LTD.
Sandown Road, Watford, Herts

CAMERON HIGHLANDS HYDRO-ELECTRIC SCHEME, MALAYA

SENIOR MECHANICAL AND ELECTRICAL ENGINEER

REQUIRED by Consulting Engineers for site construction staff, SENIOR MECHANICAL AND ELECTRICAL ENGINEER to oversee the erection and setting to work of hydro-electric generating plant, switchgear, cabling, etc. The plant includes 100 MW of Pelton and 5½ MW of Francis driven generating plant.

The work would be entirely in the field. The Engineer would act under the general direction of the Chief Resident Engineer and may expect to have one Mechanical and one Electrical Assistant Engineer.

The applicant should be a corporate member of one of the senior institutions and have had substantial experience in a similar capacity.

The appointment would be for approximately 2½ years, commencing in the latter part of 1961. Passages provided, free medical attention, transport allowance, concessionary housing, salary £3,800 p.a.

Applications should be made in writing within 3 weeks of the publication of this advertisement, giving full details of previous experience, age, marital status, etc., and clearly marked "Senior Mechanical and Electrical Engineer," to Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, London, S.W.I.

581



ASSISTANT CHIEF DRAUGHTSMAN

SWITCHGEAR DEPT.

J. & P. Ltd., invite applications for the position of Assistant to Chief Draughtsman. Applicants must have practical and D.O. experience in Industrial Switchgear. Minimum qualifications H.N.C. Applications stating age, training and experience to:

Employment Manager
JOHNSON & PHILLIPS LTD.
Charlton, London, S.E.7

605

JOURNEYMAN ELECTRICIAN

with A.C. and D.C. experience for Maintenance Department of COTTON TEXTILE FACTORY operating under British management in UGANDA. Five-year contract, 4 months' home leave after $3/3\frac{1}{2}$ years, passages paid out and home, bachelor or married accommodation at reasonable rentals, pension scheme.

Reply with particulars of age, family responsibilities, qualifications and experience to—Box 625.

IMPERIAL CHEMICAL INDUSTRIES LIMITED
PLASTICS DIVISION

has immediate vacancies for

ELECTRICAL DESIGN DRAUGHTSMEN

in its Engineering Department at Welwyn Garden City

Candidates should have served a recognised apprenticeship, and should hold at least an Ordinary National Certificate. Experience of factory and general industrial installation work would be useful.

Good starting salaries will be paid and Pension and Profit Sharing schemes are in operation. For married men a temporary lodging allowance may be granted and assistance is given towards removal expenses.

Apply briefly quoting reference No. 5110/AX to

The Staff Manager

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Plastics Division, Bessemer Road, Welwyn Garden City, Herts.

579



West Gorton
MANCHESTER

have vacancy for a

DISTRIBUTION TRANSFORMER DESIGNER

Applicants should preferably have experience of transformers up to 1500 kVA and should have a degree or H.N.C. in Electrical Engineering. Consideration would, however, be given to applicants holding the requisite qualification but without transformer experience, and who are seeking design experience.

Application forms can be obtained from

T. J. Lunt, Staff Manager, Ferranti Limited, Hollinwood, Lancs.

Please quote reference TM.

618

NORTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD

REGIONAL ENGINEER'S DEPARTMENT

Careers in hospital engineering work offered in a newly created department specialising in hospital building and engineering development projects.

ELECTRICAL ENGINEERS (MAIN GRADE) Salary £950—£1,650. Applicants must be A.M.I.E.E. Graduate members eligible on scale up to £1,255.

ENGINEERING DRAUGHTSMEN 3 grades of appointment available according to experience with salaries ranging from £570—£1,300. Three years' practical and theoretical training required for lowest grade; H.N.C. for highest.

STARTING SALARY FOR ALL POSTS depend on qualifications and experience. Superannuation Scheme. Mileage payments for use of car. Staff restaurant.

APPLICATIONS giving age, qualifications, present salary and full details of experience with dates, and names and addresses of two referees to the Secretary, North East Metropolitan Regional Hospital Board, 40, Eastbourne Terrace, London, W.2, within fourteen days.

EASTERN ELECTRICITY BOARD

A PPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

Chilterns Sub-Area
DEMONSTRATOR, BEDFORD
DISTRICT (66/61.R).
Applicants should have had domestic science training including electrical housecraft; should preferably hold the E.A.W. Certificate; should be able to assist in building the domestic load by studying new housecraft techniques and new electrical appliances and by helping housewives to select, buy and use efficiently the appliances most suited to their needs.
Salary N.J.C. Grade 1 (£600-£700).
Apply by letter to the Manager, Bedford District, Eastern Electricity Board, Prebend Street, Bedford, by 21st April, 1961.
SENIOR DEMONSTRATOR.

SENIOR DEMONSTRATOR,

SENIOR DEMONSTRATOR,
LUTON DISTRICT
(64/61.R).

The duties are mainly concerned with the sales development of all types of domestic appliances and the promotion of demonstrations in the Board's showrooms and in suitable halls to further this end.

Applicants should have had a sound training in domestic science and hold a recognised diploma. They should be capable of arranging and giving talks on domestic electrical subjects to women's organisations, school authorities and groups of students.

Salary N.J.C. Grade 2 (£700/£775).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton, by 21st April, 1961.

Essex Sub-Area
FOURTH ASSISTANT ENGINEER,
SOUTHEND DISTRICT
(63/61.R).
Candidates

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems including substations.

Salary N.J.B. Class H, Grade II (£890-

Apply by letter giving age, experience and present employment to J. Linton, A.H.W.C., M.I.E.E., A.I.Mech.E., Manager, Southend District, Eastern Electricity Board, 85, London Rd., Southend-on-Sea, Essex, by 21st April, 1961.

Northmet Sub-Area THIRD ASSISTANT ENGINEER, ENFIELD DISTRICT

(65/61.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including sub-

Salary N.J.B. Class G, Grade 9 (£965-£1,090)

Plus London allowance.

Apply by letter to A. T. Durbridge, Manager,
Eastern Electricity Board, Enfield District, 40,
Church Street, Enfield, Middx., by 21st April, 1961.

CITY OF SHEFFIELD

City Architect's Department

Appointment of Assistant Engineer (Electrical), Grade A.P.T. III (£960-£1,140)

PPLICATIONS are invited for this appoint-

A PPLICATIONS are invited for this appointment on the permanent staff of the City Architect, Mr. J. L. Womersley.

Applicants should possess the Higher National Certificate in Electrical Engineering, should have had a sound technical training, some knowledge of installation practice in large buildings, be good draughtsmen, and capable of preparing drawings and specifications under limited supervision. vision.

Commencing salary within the above grade commensurate with the successful applicant's qualifications and experience.

Applications stating age, education, training, qualifications, experience, present and past appointments (with dates and salaries), and the names and addresses of two referees, should reach me by Monday, 24th April, 1961.

JOHN HEYS, Town Clerk. Town Hall, Sheffield, 1. 617



SENIOR ELECTRICAL DRAUGHTSMAN

LAPORTE CHEMICALS LIMITED, LONDON (a member of the Laporte Group of Companies) require a Senior Electrical Draughtsman for interesting work on large chemical plant installations. Applicants should have some works experience in heavy industry and technical ability to deal with a large variety of problems. Duties include the preparation of power and lighting schemes.

The position is permanent and an attractive salary will be offered to the selected applicant. Modern offices situated in the London E.C.4 area. Five-day week and superannuation scheme. Applications will be treated in the strictest confidence.

Replies, giving details of age, qualifications and experience should be addressed to the Group Personnel Manager, LAPORTE INDUSTRIES LIMITED, Hanover House, 14 Hanover Square, London, W.1, quoting reference ICL/ER1/29.

FOSTER WHEELER LIMITED



have immediate vacancies for

DESIGN DRAUGHTSMEN, DRAUGHTSMEN AND MATERIAL CONTROLLERS

for the Electrical Section of the Process Plants Division.

The work is in connection with Oil Refineries and Petro-chemical Plants and it is essential that applicants should have had experience of large industrial electrical installations.

These are permanent positions offering good salaries, commensurate with experience.

New offices, 5-day week, Pension and Life Assurance Schemes, Luncheon Vouchers, Bonus Scheme,

We shall be pleased to arrange evening interviews.

Please write fully giving age, qualifications and experience, and quoting Ref: 59/AK, to:

Office Manager, FOSTER WHEELER LIMITED,

Foster Wheeler House, Chapel Street, London, N.W.1.

(Adjacent to Edgware Road Station)

564

BACKER ELECTRIC COMPANY LIMITED DESIGN ENGINEER DRAUGHTSMAN

Applicants should preferably have experience of electric heating techniques as applied to domestic appliances and or industrial equipment and be capable of leading and controlling a small drawing office staff engaged on the design and application of tubular sheathed electric heating elements.

Apply stating age, present salary and fullest details of qualifications, education and past experience to the

Secretary, Backer Electric Company Limited, Fitzwilliam Road, Rotherham.

BRIGHTON EDUCATION COMMITTEE

Brighton Technical College

Principal: G. E. Watts, C.B.E., M.A. Ph.D.(Cantab), B.Sc.(Lond.), F.R.I.C.

REQUIRED for 1st September, 1961:—
LECTURERS (2) in ELECTRICAL
ENGINEERING, to teach to final Degree and
Diploma standard. For one post ability to offer
Electrical Measurements as a specialist subject
an advantage. Degree and/or corporate
membership of professional institution essential.
Salary £1,370 × £35 (4) × £40 to £1,550.
Increments may be allowed for approved experience.

Further particulars and forms of application from the undersigned to be returned to the Principal, Brighton Technical College, Rich-mond Terrace, Brighton, 7, within fourteen

54, Old Steine, Brighton.

W. G. STONE Director of Education

CITY AND COUNTY OF THE CITY OF EXETER

Station Engineer, Pynes Waterworks

A PPLICATIONS are invited for the above appointment. Salary Grade V, Miscellaneous Division (£685 to £760).

Applicants should not be more than 45 years of age and must be competent electrical fitters, and experienced in operating diesel and electrically driven pumping machinery. Some experience in operating a water purification plant would be considered an advantage.

Housing accommodation, on reasonable terms, will be provided at the Waterworks.

Applications on forms, to be obtained from

Applications on forms, to be obtained from the undersigned, must be delivered not later than Monday, 24th April, 1961.

JOHN BRIERLEY,

City Engineer, Surveyor and Water Engineer.

7, Southernhay West, Exeter. 5th April, 1961.

596

CAMERON HIGHLANDS HYDRO-ELECTRIC SCHEME MALAYA

ASSISTANT **ELECTRICAL ENGINEER**

REQUIRED by Consulting Engineers for Site Construction Staff:
ASSISTANT ELECTRICAL ENGINEER to oversee the erection and setting to work of two or more 132-kV stepdown substations.

The work would be entirely in the field and under the direction of the Resident Engineer (Transmission).

Applicants should be corporate members of one of the senior institutions and have experience of work of a like

The appointment would be for approxirately 18 months with provision for extension, commencing in August, 1961. Passages provided, free medical attention, transport allowance, concessionary housing. Salary in the range £2,900 to £3,300 p.a. according to qualifications.

Applications should be made in writing Applications should be made in writing within 14 days of this advertisement, plainly marked "ARE(T)," giving full details of qualifications, previous experience, age, marital status, etc., to Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, London, S.W.I.

SUPERVISING/CONTRACTS ENGINEER

required

having served a recognised apprentice-ship in electrical contracting; experienced in the control and running of industrial and commercial contracts.

This is an excellent opportunity for a man with drive and initiative, able to control labour, progress materials and resolve contractual problems.

First - class salary, superannuation scheme, transport facilities, and scope for further advancement in the future.

Applications, which will be treated in strict confidence, to be addressed to:—

Managing Director SCULL ELECTRICAL LIMITED Redcliffe House, Bristol, 3

623

624

ESTIMATOR-DRAUGHTSMEN

required for Low Voltage A.C. Switchgear and Busbar Trunking Systems

DUTIES will entail design and contracts draughting, estimating, works order initiation, and customer liaison. A minimum of three years' experience in the drawing office of a switchgear manufacturer is essential.

Excellent salaries and working conditions apply to these posts, and a voluntary pension scheme is in operation. Housing will be available if required, and the company will assist with removal

Please reply, in strict confidence, to:-

Chief Design Draughtsman ASHLEY ACCESSORIES Ulverston, N. Lancs

ELECTRICAL DEVELOPMENT ASSOCIATION

ASSISTANT DIRECTOR

The Chairman and Council of the British Electrical Development Association invite applications for a new appointment as Assistant Director.

The Association, formed in 1919 to promote the increased use of electricity, is supported by the Electricity Supply Industry in Great Britain and Ireland. Its objects are to develop all forms of electricity utilisation, principally through press advertising campaigns, exhibitions, publications, the sponsorship of films and by other means of educational and advisory work.

The successful candidate will need to have had extensive executive experience in responsible positions in the electrical industry, ability in the field of public relations, and a full measure of initiative, enthusiasm and imagination. Powers of negotiation and organisation, a co-operative spirit and the ability to speak in public are also essential. It follows in view of this experience that his age will be in the region of 45/55. The salary will depend upon qualifications but a minimum of £3,500 p.a. is envisaged with appropriate superannuation benefits.

Applications (the closing date for which will be 24th April) with full details of education and professional qualifications, training and subsequent career, and present salary, should be clearly marked "Assistant Director" and addressed to:-

Director and Secretary

ELECTRICAL DEVELOPMENT ASSOCIATION

2 Savov Hill, London, W.C.2

562

ENGLISH ELECTRIC STAFFORD

invite enquiries from

TECHNOLOGISTS AND TECHNICIANS

who would like to make contributions at various relevant levels to a number of

DEVELOPMENT PROJECTS

- (1) Power System studies using analogue computer, network analyser and other similation techniques.
- (2) Transducer applications for stress and vibration analysis.
- (2) Fundamental investigations into:

 (a) Mechanical problems, and
 (b) Dielectric properties of materials.

 (4) Development and proving tests on the performance of high power and electrical equipment.
 (5) Investigations on electrical insulating materials and processes, with particular reference to development and use of electrical measuring techniques.

All these posts, while being primarily concerned with serving Stafford Works, also serve the Company in general and an appreciable part of the work is done on a group basis.

The posts are all permanent and pensionable and applicants will be able to discuss accommodation and removal details at interview.

Applications should be sent, giving full details, to the Technical Staff Officer, English Electric House, Strand, London, W.C.2, quoting ref. ER 1295N.

MANAGING ABILITY

We require a man with management ability. To this attribute must be added a comprehensive knowledge of the electrical and electronic equipment in modern ships. In addition, the position requires patience, tact, resource, perseverance and the ability to lead a large number of men.

The position is overseas in a congenial climate suitable for a family man.

It should be obvious from this advertisement that we are looking for a man of good general education and membership of the Institution of Electrical Engineers or equivalent.

If you are of this standard why not apply; we guarantee strict confidence. Anyone not fulfilling these requirements is asked not to apply.

Write Box ER.444 c/o Hanway House, Clark's Place, London, E.C.2

NORTH EASTERN ELECTRICITY BOARD | SOUTH EASTERN ELECTRICITY BOARD |

A PPLICATIONS are invited from sunaday qualified engineers for the following appointments which are subject to the conditions of the National Joint Board. PPLICATIONS are invited from suitably

Wear Sub-Area

THIRD ASSISTANT ENGINEER, SUB-AREA ENGINEER'S STAFF, OPERATION AND MAINTENANCE

OPERATION AND MAINTENANCE SECTION,
SUB-AREA HEADQUARTERS,
SUNDERLAND.
The successful applicant will be required to assist with the operation and maintenance of h.v. and l.v. overhead and underground distribution networks and substations, up to and including 66 kV

ribution networks and substations, up to and including 66 kV.

Salary Schedule A, Class L, within Grades 10-11, £1,115/£1,325 per annum.

It is not necessary for applicants to previous advertisement for above appointment to re-

THIRD ASSISTANT DISTRICT
ENGINEER, DURHAM.
Applicants must have had sound practical training and experience in the construction, operation and maintenance of h.v., m.v. and l.v. overhead and underground distribution networks substation plant and auxiliary equipment. works, substation plant and auxiliary equipment Salary Schedule A, Class G, Grade 9, £965/ £1,090 per annum.

Tees Sub-Area
DISTRICT COMMERCIAL ENGINEER,
STOCKTON DISTRICT.
Applicants should have experience in the
utilisation of electrical energy in commercial and
domestic premises, knowledge of installation
work and be conversant with tariffs, sales and all aspects of consumer service. Duties of the post include responsibility for commercial administration of the District, control of two service centres, contracting and consumer service arrangements.

Salary Schedule A, Class G, Grade 3, £1,440

£1,610 per annum.

York Sub-Area

THIRD ASSISTANT DISTRICT
ENGINEER, YORK DISTRICT.
Applicants should have experience on high
and low voltage, urban and rural, overhead and
underground distribution systems.
Salary Schedule A, Class G, Grade 9, £965/

Salary Schedule A, Class G, Grade 9, £965/ £1,090 per annum. Applications stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement.

MIDDLESEX COUNTY COUNCIL EDUCATION COMMITTEE

Twickenham Technical College Egerton Road, Twickenham

Principal: J. P. Wolfenden, M.Sc., M.I.E.E.

Department of Electrical Engineering and Physics

A PPLICATIONS are invited from qualified A engineers for two new posts of LECTURER. Duties to commence 1st Sep-

tember, 1961.

(1) LECTURER IN ELECTRONICS with experience in transistor applications.

(2) LECTURER IN ELECTRICAL POWER with experience in the control of electrical machines.

The work of the department is rapidly expanding and includes Higher National Certificate, Higher National Diploma, Part III Examination of the Institution of Electrical Engineers, Post Graduate and Special Lecture courses. Large extensions opened in 1960 have provided well equipped laboratories and workshors.

shops. Candidates should Candidates should possess a degree or graduate equivalent and have had suitable industrial experience. Part-time or full-time teaching experience is desirable but not essential.

Salary within the range of £1,408 to £1,601

SSISTANT DISTRICT ENGINEER, Twickenham and Richmond District.

A Twickenham and Richmond District.

Salary £1,040-£1,165 p.a. plus London allowance under N.J.B. Class F, Grade 7. (Re-classification to Class G pending). Superannuable. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of M.V. and 11 kV underground systems. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. The successful applicant will be required to undertake standby duties.

duties.

Applications quoting ER, on forms from District Manager, SEEBOARD, 42, York Street, Twickenham, Middlesex, by 26th April, 1961.

ASSISTANT DISTRICT ENGINEER, Guildford District.

ASSISTANT DISTRICT ENGINEER, Guildford District.

Salary £1,040-£1,165 under N.J.B. Class F, Grade 7. Superannuable. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of M.V. and 11 kV underground and overhead systems. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. The successful applicant will be required to undertake standby duties.

Applications quoting ER, on forms from District Manager, SEEBOARD, Woodbridge Road, Guildford, Surrey, by 26th April, 1961.

OVERHEAD LINESMAN (up to 30,000 volts), Crawley and Horsham District.

Applicants should be experienced in the erection and maintenance of wood pole H.V. and M.V. overhead lines. Wages 5s. 4½d. per hour for a 42-hour, 5-day week under N.J.I.C. Agreement.

Applications quoting ER, and naming two referees, to District Manager, SEEBOARD, 50/52, The Broadway, Crawley, Sussex, by 24th April, 1961.

GEORGE WRAY,

RAY, Secretary. 652

SOUTH OF SCOTLAND ELECTRICITY BOARD

A PPLICATIONS are invited for the under-noted superannuable appointments:—

A noted superannuable appointments:—

(1) SENIOR ASSISTANT ENGINEER, PLANNING AND ECONOMICS SECTION, CHIEF COMMERCIAL OFFICER'S DEPARTMENT at BOARD HEADQUARTERS (Ref. Cz/61).

Applicants should have had experience in the generation and distribution sides of an electricity supply organisation and should possess a good knowledge of statistical theory, costing, supply economics and tariff design. The duties will include commercial studies on generation economics, supervision of programmes of utilisation research and the statistical analyses of the data, and the design of bulk supply and retail tariffs.

tams.

Corporate Membership of either the Institution of Electrical Engineers or the Institution of Mechanical Engineers is desirable.

Salary N.J.B. Class BX, Grade 3, £1,570/£1,950 per annum.

(2) ASSISTANT SHIFT CHARGE ENGINEER, HUNTERSTON NUCLEAR GENERATING STATION (Ref. Gtz/61).

NUCLEAR GENERATING STATION (Ref. G12/61).

The successful applicant will be responsible for delegated duties while on shift in the operation of both nuclear and conventional plant. The minimum technical standard will be the possession of a Higher National Certificate. Previous experience in power station operation is essential. The successful candidate will be given a course in the operation of nuclear reactors.

Salary N.J.B. Class M, Grade 8, £1,440/£1,610 per annum, plus shift allowance of 10% per annum while on shift duties.

Persons who made application for the above position when previously advertised will be reconsidered without further application.

Applications questing appropriate reference.

per annum.
Further particulars and application forms may be obtained from the Principal to whom completed forms should be returned within 14 days.
C. E. GURR, M.Sc., Ph.D.,
Chief Education Officer.

Chief Education Officer.

650

Considered without further application.

Applications, quoting appropriate reference, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 21st April, 1961.

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Planning)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 11 (£765-£870 per annum). N.J.B. conditions of

service.

The duties of the post will be to assist in the The duties of the post will be to assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks and to undertake standby duties if required. Suitable technical qualifications are necessary.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1228, not later than 24th April, 1961.

General Assistant Engineer

Construction Department of No. 2 (Newbury) Sub-Area, located at Newbury (East Sub-Section). Salary N.J.B. Class M, Grade 18 (£715-£805 per annum). N.J.B. conditions of

The duties of the post will be to assist with The duties of the post will be to assist with the installation and erection of plant, equipment, and overhead lines, the laying of cables and other constructional work on all distribution systems up to and including 33 kV.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1317, not later than 24th April, 1961.

Senior Service Centre Assistant

Newbury District of No. 2 (Newbury) Sub-Area. Salary N.J.C. 2 (£700-£775 per annum). N.J.C. conditions of service.

Applications of service.

Applicants must be capable of supervising staff and should have had experience in all showroom duties. They should have a sound knowledge of domestic and commercial apparatus, window displays, sales procedures, the application of tariffs and consumer service.

Applications on forms obtainable from the

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1327, not

later than 24th April, 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

ENGINEERING DESIGNER **DRAUGHTSMEN**

required by Air Ministry in London.
Salary (inner London scale) Grade III, £658-£1,048 (£866 at age 25), starting salary depends

on age, quals, and exp.

ELECTRICAL ENGINEERING

DESIGNER DRAUGHTSMEN experienced in
preparation of schemes for illumination and
electrical equipment of buildings or schemes for
H.V. and M.V. electrical distribution (Grade
III). III).

H.V. and M.V. electrical distribution (Grade III).

Candidates should have served a recognised apprenticeship or have had equivalent training and also adequate practical experience. Possession of recognised technical qualifications an advantage, financial assistance and time off may be allowed for recognised courses of study for technical qualifications, 5-day week with 18 days paid leave p.a. initially. Promotion and pension prospects. Some overseas tours with special allowances in addition to salary.

Applicants who must be natural born British subjects, should write (quoting Kings Cross O/N 803) to AIR MINISTRY, W.G.d, LACON HOUSE, THEOBALDS RD., LONDON, W.C.I, or to ANY EMPLOYMENT EXCHANGE, giving age, details of training, qualifications and full particulars of former posts held. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only candidates selected for interview will be notified.

OXFORDSHIRE EDUCATION COMMITTEE

North Oxfordshire Technical College and School of Art, Bath Road, Banbury

PPLICATIONS are invited for the post of A ASSISTANT GRADE A to teach electrical subjects in O.N.C. and City and Guilds courses. Application forms obtainable from the Principal, to whom they must be returned by 5th May.

County Offices,

A. R. CHORLTON,
Director of Education.

Oxford.

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area
SENIOR ASSISTANT ENGINEER
(Construction) (Construction).

Applicants should have wide experience in programming and supervising construction work for substations, buildings and underground/ overhead networks in industrial, urban and rural areas, together with ability to take administrative control, under the Sub-Area Engineer, of the Construction Section. Preference will be given to Corporate Members of the Institution of Electrical Engineers or to applicants with equivalent qualifications.

Salary N.J.B. Class L, Grade 4 (Scale 16), £1,795/£1,950 per annum.

Applications together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 28th April, 1961. Applicants should have wide experience in

No. 2 (Huddersfield) Sub-Area SECOND ASSISTANT COMMERCIAL ENGINEER
(Service Centres, Publicity and Domestic Sales).

Domestic Sales).

The duties comprise responsibility to the Sub-Area Commercial Officer for all aspects of domestic development. Candidates should have considerable experience in the control of service centres, window and interior display, publicity, direct mail, exhibitions, demonstrations, and possess ablity and enthusiasm for appliance sales promotion.
Salary N.J.B. Class L, Grade 7 (Scale 13), £1,440/£1,610 per annum.

Applications together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 28th April 1061. than 28th April, 1961.

No. 3 (Sheffield) Sub-Area
SHEFFIELD EAST DISTRICT
SECOND ASSISTANT DISTRICT
ENGINEER.

Applicants should possess technical qualifi-cations equivalent to Corporate Membership of the Institution of Electrical Engineers and be experienced in the working of an electricity supply district.

Experience in the operation, maintenance and construction of substations and mains, both overhead and underground, and in the planning and estimating of development schemes on an electricity distribution system with voltages up to 33 kV will be an advantage.

Salary N.J.B. Class J, Grade 7 (Scale II), £1,275/£1,410 per annum.

SHEEFIELD CENTRAL DISTRICT

SHEFFIELD CENTRAL DISTRICT THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have technical qualifications equivalent to Graduate Membership of the Institution of Electrical Engineers and should have had experience in the work of a District Engineering Department, including construction, operation, maintenance and planning.

Sheffield, despite its heavy industries, is on the edge of the Peak National Park with attractive residential areas.

Salary N.I.B. Class H. Grade o (Scale 8)

tive residential areas.
Salary N.J.B. Class H, Grade 9 (Scale 8),
£1,040/£1,165 per annum.
Applications together with the names of two
referees, should be sent to the Manager, No. 3
(Sheffield) Sub-Area, Yorkshire Electricity
Board, Commercial Street, Sheffield, 1, not later
than 28th April 1061 than 28th April, 1961.

No. 1 (Bradford) Sub-Area FOURTH ASSISTANT ENGINEER

(Construction). Applicants should be Graduate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

equivalent qualifications.

They should be capable of planning and supervising work in connection with the design and construction of H.V. overhead and underground networks up to and including 33 kV. They will also be required to assist other engineers in supervising construction work in progress at primary substations.

Salary N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, 1, not later than 28th April, 1961.

CAMERON HIGHLANDS HYDRO-ELECTRIC SCHEME MALAYA

ELECTRICAL INSPECTOR

REQUIRED by Consulting Engineers for Site Construction Staff: ELECTRICAL INSPECTOR to oversee the erection and setting to work of generators, switchgear, cabling, etc., in connection with hydro-electric stations and associated stepdown substations. The plant involves some 106 MW of generating plant.

The work will be entirely in the field. The Inspector would act under the direction of the appropriate Assistant Resident Engineer.

The applicant should be well qualified by education and experience to supervise the several aspects of the electrical side of power station plant.

The appointment would be for approxi-The appointment would be for approximately three years with short home leave at a time near the middle of the period suited to the requirements of the work, and commence about October, 1961. Passages provided, free medical attention, transport allowance, concessionary housing. Salary £1,900 p.a. Preference will be given to single men or men prepared to fulfil the engagement without wife or family.

Applications should be made in writing within 14 days of the publication of this advertisement, plainly marked "I.E.," to Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, London, S.W.I.

ELECTRICAL DEVELOPMENT ENGINEER

required to initiate and carry out research and development work on resistors and heaters at company's laboratory near Redhill, Surrey. Good salary. Pension. Apply Research Director, The Expanded Metal Co. Ltd., 16, Caxton Street, London, S.W.I.

SOUTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER

A PPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER in the West Mon. District (Bargoed) of the Monmouthshire and Mid-Wales Area.

The duties of this post will be of a general nature and preference will be given to Engineers possessing the Higher National Certificate in Electrical Engi-

Salary N.J.B. Class H, Grade 11, Scale 6 (£890/£1,015 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to the Manager, Monmouthshire and Mid-Wales Area, Llywelyn Road, Cwmbran, Mon., to arrive not later than 29th April, 1061. TOST.

Please quote reference 49/61/ER, endorsing envelope "Assistant Engi-49/61/ER,

> R. G. WILLIAMS, Secretary.

SOUTH WESTERN ELECTRICITY BOARD

MECOND ASSISTANT ENGINEERS

(Planning) (2),
SOMERSET GROUP.
Salary within Class J, Grade 8, Salary Scale
10 (£1,190 to £1,325 per annum) of the N.J.B. Agreement.

Agreement.

The person appointed will be required to undertake planning and the preparation of schemes and estimates for the extension and reinforcement of the distribution systems, both

reinforcement of the distribution systems, both overhead and underground.

Candidates should have a wide experience of planning, construction and operation of distribution systems and a knowledge of budget preparation and long-term forecasting.

Qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers are most desirable.

Applications to be on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the Group Administrative Officer, South Western Electricity Board, Priorswood Road, Taunton. Closing date for receipt of completed applications is 29th April, 1961.

FOURTH ASSISTANT DISTRICT
ENGINEER, TAUNTON,
OUTPOSTED AT BRIDGWATER.
Salary within Class G, Grade 11, Salary
Scale 5 (£825 to £940 per annum) of the N.J.B.

Scale 5 (4,825 to 4,940 per annum) of the N.J.B. Agreement.

The successful candidate will be outposted at Bridgwater and will be required to assist generally in the Engineering Department on construction, operation and maintenance of the distribution system up to and including voltages of 33 kV, under the outposted Engineer in Charge, at Bridgwater. The candidate appointed will be required to undertake standby duties on a rota basis.

Duties will normally be in the Bridgwater area, but the successful candidate may be required to work anywhere within the Taunton

required to work anywhere within the Taunton District.

Candidates should have experience in the erection and maintenance of overhead and underground H.V. and L.V. networks including substations, and should have previous experience of operating systems up to and including 33 kV. The possession of the Ordinary National Certificate in Electrical Engineering is desirable.

Applications to be on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Parade, Taunton. Closing date for receipt of completed applications is 29th April, 1961.

29th April, 1961.

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

FOURTH TOURTH ASSISTANT ENGINEER (Vacancy No. ER/AV/38/61) required in the BRISTOL DISTRICT of the DIVISIONAL ELECTRICAL DEPARTMENT.
Superannuation scheme. Salary N.J.B. Class AX, Grade 9, Scale 9, £1,005-£1,245 per annum

Possession of, or studying for, qualifications leading to Corporate Membership of the Institution of Electrical Engineers or an equivalent qualification would be an advantage.

Practical works experience in manufacture, testing and/or protection of electrical plant is required along with a knowledge of site erection or commissioning procedure on high voltage transmission equipment.

FOURTH ASSISTANT ENGINEERS (Vacancy No. ER/AV/39/61) required in the BRISTOL AND TAUNTON DISTRICTS of the DIVISIONAL ELECTRICAL DEPARTMENT.

Superannuation scheme. Salary N.J.B. Class AX, Grade 11, Scale 7, £855-£1,090 per

annum.

Possession of, or studying for, qualifications leading to Corporate Membership of the Institution of Electrical Engineers or an equivalent qualification would be an advantage.

Knowledge of manufacture and testing of light or heavy electrical equipment associated with the Generating Board's high voltage transmission system will be an advantage. Alternatively, previous training on transmission system within the industry.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 25th April, 1961.



MIDLANDS ELECTRICITY BOARD

PPLICATIONS are invited for the follow-A ing superannuable posts:-

Central Gloucestershire Area

Central Gloucestershire Area
SECOND ASSISTANT DISTRICT
COMMERCIAL ENGINEER
(Dean Forest).
The successful applicant will be required for duties in connection with the Contracting and Consumers' Service Section, and should have had experience in estimating for all classes of electrical installation work, the preparation of tenders, and specifications. A sound knowledge of installation practice, refrigeration and electrical apparatus repairs, with good commercial ability, is necessary. Technical qualifications desirable. Salary £890/£1,015 per annum (N.J.B. Grade E.8).
Apply by letter within 14 days stating age,

(N.J.B. Grade E.S).

Apply by letter within 14 days stating age, experience, present position and salary to Mr. S. Raybould, Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

North Staffs. Area

THIRD ASSISTANT DISTRICT
ENGINEER (Leek/Congleton).
Duties include the construction, operation and maintenance of H.V. and M.V. mains and substations, and applicants should have had experience in the planning of system reinforcements and mains extensions. Salary £965/£1,090 per annum (N.J.B. Grade G.9).

GENERAL ASSISTANT DISTRICT
ENGINEER (Stafford).
Applicants should have had a sound technical training and experience in construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £715/£805 per annum (N.J.B. Grade F.12).

GENERAL ASSISTANT ENGINEER
(Survey) (Area Office).
The successful applicant will be required to assist in survey and profile work. Salary £715/£805 per annum (N.J.B. Grade L.17).
Apply by letter within 10 days stating age, experience, present position and salary to Mr. C. C. Pinble, Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stokeon-Trent.

F. W. CATER, Secretary.

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

Appointment of Regional Public Relations Officer (Vacancy No. MR.155)

A PPLICATIONS are invited for the post of REGIONAL PUBLIC RELATIONS OFFICER in the Midlands Region of the Central Electricity Generating Board at Birmingham.

Birmingham.

The successful applicant will be on the staff of the Regional Secretary and the duties will include press relations, internal and external information services, production of booklets, posters, etc.; the preparation or collection of material for lectures, conferences and exhibitions, the organisation of visits and the reception of visitors and various other publicity matters throughout the Region.

The appointment will be made within the

The appointment will be made within the salary range £1,965-£2,170 per annum.

A knowledge of the organisation of the electricity supply industry would be an advantage, but it is not essential.

Applications from suitably qualified persons, quoting the above vacancy number, should be addressed to the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, Midlands Region, 53, Wake Green Road, Birmingham, 13, marked "Confidential," to arrive not later than Monday, 1st May, 1961.

ENGLISH ELECTRIC STAFFORD

require

ELECTRICAL AND MECHANICAL DRAUGHTSMEN

Our principal vacancies are for designers and detailers to work on:-

A.C. and D.C. MOTORS AND GENERATORS **SWITCHGEAR** TRANSFORMERS

but we also have several vacancies for individual draughtsmen in various other departments, including:--

MINING, METAL INDUSTRIES, PROTECTION ENGINEERS AND INSTRUMENT DEPARTMENT

All these vacancies are permanent and pensionable and full details of staff service together with details of accommodation and removal assistance will be given at interview.

Applications from men at both senior and junior levels will be welcomed and should be directed to Department G.P.S., English Electric House, Strand, London, W.C.2, quoting reference ER1299/U.

EASTERN ELECTRICITY BOARD

PPLICATIONS are invited for the follow-A PPLICATIONS are invited for the follow-ing appointments. The successful candi-dates will be required to contribute to a super-annuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

Chilterns Sub-Area

THIRD ASSISTANT ENGINEERS,
SUB-AREA HEADQUARTERS.
The following appointments are in the Operation and Maintenance Section of the Sub-Area Engineer's Department.
Appointment (a) in Maintenance Sub-Section (71/61.N).
The duties will include the supervision of the repair and maintenance of 33 kV substation plant and equipment, underground cables and overhead lines by direct and contract labour.
Appointment (b) Commissioning and Protective Gear Sub-Section (72/61.N).
The duties will include the commissioning of substations up to 33 kV, including protection equipment and ancillary apparatus, pressure testing and fault location.
Salary for both appointments N.J.B. Class L, Grade 10 (£1,190-£1,325).
Apply by letter to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, by 28th April, 1961, and indicate preference for appointment (a) or appointment (b). ment (b).

Northmet Sub-Area

Northmet Sub-Area
TOTTENHAM DISTRICT
SECOND ASSISTANT ENGINEER
(Ref. 1051) (73/61.N).
Candidates should have had a sound technical training and considerable experience in the construction, operation and maintenance of underground distribution systems at voltages up to and including 33 kV.
Salary N.J.B. Class F, Grade 7 (£1,040-£1,165), plus London allowance.
Apply by letter to J. A. K. Bowerman, A.M.I.E.E., Manager, Eastern Electricity Board, Tottenham District, 315, High Road, Tottenham, London N.15, by 28th April, 1961.
SENIOR SALES REPRESENTATIVE

SENIOR SALES REPRESENTATIVE

SENIOR SALES REPRESENTATIVE

(Ref. 1048) (70/61.R).

Candidates should have had practical training with experience of domestic and small commercial and industrial installations. An ability to sell appliances with advice to consumers on supply matters, tariffs and apparatus is required. Salary N.J.C. Grade 2 (£700-£775), plus London allowance.

Apply by letter to J. A. K. Bowerman, A.M.I.E.E., Manager, Eastern Electricity Board, Tottenham District, 315, High Road, Tottenham, London, N.15, by 5th May, 1961.

EDMONTON DISTRICT

EDMONTON DISTRICT DISTRICT COMMERCIAL ASSISTANT

(Ref. 1049) (69/61.R).
Candidates should be fully experienced in modern installation practice, able to prepare specifications and competitive quotations and be competent to design thermal storage heating schemes, particularly floor warming. A sound

knowledge of the tariffs and their application, including supply by special agreement

necessary.
Salary N.J.C. Grade 3 (£780-£880), plus

London allowance.

Apply by letter to C. A. Baker, B.Sc. (Eng.)(Lond.), M.I.E.E., Manager, Eastern Electricity Board, Edmonton District, 305, Fore Street, Edmonton, London, N.9, by 28th April, 265.

HORNSEY DISTRICT

HORNSEY DISTRICT
THIRD ASSISTANT ENGINEER
(Ref. 1026) (74/61.N).
Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.
Salary N.J.B. Class G, Grade 9 (£965-£1,090), plus London allowance.
Apply by letter to C. Bradley, M.I.E.E., Manager, Eastern Electricity Board, The Broadway, Crouch End, London, N.8, by 28th April, 1961.

SURREY EDUCATION COMMITTEE

Kingston Technical College Fassett Road, Kingston-upon-Thames

REQUIRED 1st September, 1961:—

(1) SENIOR LECTURER in Electrical Engineering; should possess degree in Electrical Engineering and appropriate professional qualifications, together with teaching and industrial or research experience, and be prepared to teach to final year degree and Part III I.E.E. level, mainly in electric power.

(2 & 3) Two LECTURERS in Electrical Engineering; should possess degree in Electrical Engineering and appropriate professional qualifications, preferably with teaching and industrial or research experience and be prepared to teach to final year H.N.D. level in wide range of electrical engineering subjects; one with a preference for heavy current engineering and one for light current engineering. current engineering.

Salary, Burnham Technical Scale, Senior Lecturer: £1,550 \times £50 to £1,750. Lecturer: £1,370 \times £35 (4)/£40 to £1,550, plus London allowance.

Application forms and further particulars from Principal, to be returned as soon as possible, in any case not later than 1st May,

MIDDLESEX COUNTY COUNCIL COUNTY ARCHITECT'S DEPT.

RIGINEERING ASSISTANT, A.P.T. III (£1,005 to £1,185 p.a.) required for section dealing with maintenance of electrical installations in schools and other county buildings. Prescribed conditions. Established, pension-

Application forms from County Architect, r, Queen Anne's Gate Buildings, Dartmouth Street, London, S.W.I, returnable by 24th April (quote F.972E.R).



MIDLANDS ELECTRICITY BOARD

PPLICATIONS are invited for the follow-A ing superannuable posts:

Combined Control Centre, South Staffs. and North Worcs. and Wolverhampton Areas

THIRD ASSISTANT ENGINEER (Shift Control) (Ref. SS/T/500).

(Ref. SS/T/500).

The successful applicant will be responsible to the Second Assistant Engineer (System Control) for directing and supervising District and Area staffs in the operation of the distribution system. Applicants should have a good knowledge of system operation and loading. Experience in the operation of supervisory controlled substations an advantage. Salary £1,350/£1,500 per annum (N.J.B. Grade N.10) plus shift allowance.

plus shift allowance.

FOURTH ASSISTANT ENGINEERS
(Shift Control)
(Ref. SS/T/499).

The successful applicants will be required to assist the Third Assistant Engineers (Shift Control). Salary £1,115/£1,245 per annum (N.J.B. Grade N.13) plus shift allowance.

Apply by letter within 14 days, stating age, present position and salary, and giving full particulars of qualifications and experience and quoting the appropriate reference number, to Mr. D. Holt, Acting Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Road, Tipton, Staffs.

Walverhampton Area

Wolverhampton Area

THIRD ASSISTANT DISTRICT
ENGINEER (Lichfield).
Applicants should have had experience in the construction and maintenance of high and medium-voltage distribution systems. Technical qualifications desirable. Salary £825/£940 per annum (N.J.B. Grade E.9).

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEERS (Cannock).

Applicants should have had experience in one Applicants should have had experience in one or more of the following commercial activities:

(1) Preparation of specifications and estimates;

(2) Repairs to consumers' apparatus and associated wiring;

(3) Negotiation of new supplies, application of tariffs and public lighting installations and maintenance. Technical qualifications desirable. Salary £715/£805 per annum (N.J.B. Grade F.12).

Apply by letter within 14 days stating age.

lations desirable. Salary **/***/**
(N.J.B. Grade F.12).

Apply by letter within 14 days stating age, experience, present position and salary to Mr. D. Holt, Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

F. W. CATER,
Secretary.

613

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS

BUILDING RESEARCH STATION,
Garston, Watford, Herts., requires
EXPERIMENTAL OFFICERS and ASSISTANT EXPERIMENTAL OFFICERS for
research on lighting principles and design.
Programme ranges from study of basic principles
of visual efficiency and comfort to practical
problems of design of artificial lighting and
daylighting techniques, and design and testing
of new lighting ideas in specific buildings.
Ability to design apparatus and prototype lighting devices necessary, and experience in photometry and illumination theory desirable.

Quals.: H.N.C., Diploma in Technology or
Pass Degree in Science or Engineering, or I.E.S.
Diploma with good A-level educational background. A.E.O. age 22 or over; E.O. min.
age 26.

age 26.
Starting pay: A.E.O. £625 (age 22) to £776 (age 26) to £957; E.O. in range £1,057-£1,296.
Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.154/1A.
656

ELECTRICAL DRAUGHTSMEN

required in London by a large contracting organisation engaged on the design and construction of Nuclear Power Stations and chemical plants.

These positions are pensionable with excellent prospects for fully experienced men.

Commencing salary up to

£1,500 p.a.

Two weeks paid holiday this year,

Please write giving full details to Box 632

BAHAMAS ÉLÉCTRÍCITY CORPORATION

Applications are invited for the position of

DISTRIBUTION CONSTRUCTION SUPERVISOR

(OVERHEAD LINES AND UNDERGROUND CABLES)

with the Bahamas Electricity Corporation in Nassau. Applicants must have had experience in construction and maintenance on an electricity supply system up to 33 kV.

The contract will be for a period of three years.

Salary will be £1,650 per annum.

Official housing is not available but a rent allowance will be paid equal to £60 per month less 15% of the officer's monthly

Economy class return air passages will be provided for the officer and his wife and family up to a maximum of three adult fares.

Upon satisfactory completion of the con-Upon satisfactory completion of the contract the person engaged will be entitled to 28 days' full pay leave for each year of service and in addition a gratuity equal to 10% of his annual salary for each year of completed service. —Two weeks' local leave may be granted annually at the discretion of the General Manager.

There is at present no income tax in the Bahamas.

The successful applicant will be provided with official transport, but will be required to undertake duty on a rota with other members of the distribution staff.

Applications should be sent in the first instance to the General Manager, Bahamas Electricity Corporation, c/o General Post Office, Nassau, Bahamas, and the envelope endorsed "Distribution Construction Supervisor."

Closing date for applications will be 28th April, 1961.

CENTRAL ELECTRICITY GENERATING BOARD

PERFORMANCE ANALYSIS ENGINEER

required in the Operational Efficiency Branch of the Operations Department at Headquarters, London, E.C.I.

Headquarters, London, E.C.r.

The engineer appointed will be required to organise and direct the work of a small section concerned with the introduction and continuous development of methods of monitoring the day-to-day efficiency of operation of the Board's National Grid system as a whole. The effective integration of the work done in the Regions on monitoring their part of the system will form an important part of the initial development. development.

The successful candidate will be required to co-ordinate the work of two associated sections concerned with statistical analysis of operation data and the application of established methods of budgetary control and standard costing as applicable to operations. operations.

The work calls for original and clear thinking over a wide field, and an ability to identify and develop solutions to intricate and non-routine problems. An honours degree or its equivalent would be an advantage coupled with recent experience in the generation side of the supply industry. The position offers scope for a person of ability.

Salary within the range £2,440-£2,655 per annum.

Applications stating age, experience, present position and salary to the Appointments Officer, 24-30, Holborn, London, E.C.1, by 28th April, Quote ref. ER/158.

645

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

A SSISTANT SHIFT CHARGE ENGINEER is required at Rugeley Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Class L, Grade 8, £1,350-£1,500 per annum, plus 10% for shift allowance.

Applicants should possess a Higher National Certificate or equivalent qualification and have had operating experience in a modern power station with high pressures and temperatures.

Apply, quoting Vacancy No. 96/61MD, on form AE.6, available from the Station Superintendent, Rugeley Power Station, Rugeley, Staffs., to whom they should be returned by 24th April, 1961.

FYLDE WATER BOARD

A SSISTANT ENGINEER (Mechanical and Electrical). Salary scale A.P.T. III (£960-£1,140) or A.P.T. IV (£1,140-£1,310). Applicants should preferably be Associate Members of the Institution of Electrical Engineers and/or Associate Members of the Institution of Mechanical Engineers for appointment to Grade IV post.

Applications will be considered from candidates of suitable experience possessing Higher National Certificate (Elec.) or Higher National Certificate (Mech.) only for appointment in Grade III with prospect of promotion to Grade IV when suitably qualified.

Heavy industrial or waterworks experience is desirable.

The work will comprise the preparation of

The work will comprise the preparation of designs and specifications for mechanical and electrical equipment for pumping, borehole, turbine, remote control and water treatment installations, and supervision of installation of same. Experience of supervision of contract work is

Experience of supervision of contract work is essential.

The Board has an extensive capital works programme in hand amounting to over £2,500,000 during the next five years. Successful applicants will therefore have ample opportunities for an interesting career. The Board at present supply an area of 437 sq. miles and a population of approx. 415,000.

Application forms and further described much

Application forms and further details of work in hand may be obtained from the undersigned.

Last date for applications, 2nd May, 1961. The appointment will be subject to the provisions of the Local Government Superannuation Acts and Regulations thereunder.

FRANK LAW,
B.Sc.Tech., M.I.C.E., M.I.W.E.
Engineer to the Board.

Sefton Street, 7th April, 1961.

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

A PPLICATIONS are invited for the following appointments in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

FOURTH ASSISTANT ENGINEERS.

Salary N.J.B. Class BX, Grades 9-11, within the range of Scales 8-10, £855-£1,325 per

The commencing salary will be within the above range at a point commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/ technical experience is desirable. The duties are on day work and are of a general technical and statistical nature, but applicants must be prepared ultimately to undertake shift duties in the Grid Control Room.

Forms of application AE.6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 22nd April, 1961, quoting reference S.V. No. 1398.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Shin Generation Group

Group Control Engineer, Shin Generating Station

PPLICATIONS are invited for the post of A FPLICATIONS are invited for the post of GROUP CONTROL ENGINEER at Shin Generating Station. Salary in accordance with N.J.B. Agreement, Class F, Grade 7 (£1,040 × £25 to £1,165) (Scale 8), plus 10% shift allowance. Superannuation scheme applicable. A house and garage can be made available to the successful applicant.

Minimum qualification required is H.N.C.

Minimum qualification required is H.N.C.
Application forms obtainable from the Generation Engineer, Shin Generating Station, Invershin, Sutherland, should be returned by 24th April, 1961.

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

SSISTANT SHIFT CHARGE ENGINEER, POOLE GENERATING STATION

(SEC/3.143).

Applicants should have had previous experience in a modern generating station, preferably one with high operating temperatures and

one with high operating temperatures and pressures.

Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional engineering institution or equivalent qualifications.

Salary N.J.B. Scale 11, Grade K.8, £1,275-£1,410, plus shift allowance.

Special application forms (not A.E.6/ACT), obtainable only from Divisional Secretary, 111, High Street, Portsmouth, should be returned by 26th April, 1961.

GRADE 12 ENGINEER,

MARCHWOOD GENERATING

STATION (SEC/3.144).

The person appointed may be required to undertake shift operational duties or perform general station duties. Previous experience of modern generating station plant is desirable.

general station duties. Previous experience of modern generating station plant is desirable. Applicants should have had a sound technical training and preferably possess qualifications leading to corporate membership of an appropriate professional institution or hold equivalent qualifications.

Salary N.J.B. Scale 8, Grade L.12, £1,040-

£1,165. £1,165. Special application forms, obtainable only from Divisional Secretary, 111, High Street, Portsmouth, should be returned by 25th April, 639

EXPORT SALES ENGINEER

THIS is an opportunity for a young engineer able to take responsibility or perhaps for an older man anxious to find an opportunity of using initiative and drive. He must be keenly interested in exports and able to work on his own to build up business in overseas regritories. territories.

Experience in some export field is desirable and a background of electrical engineering experience with qualifications to degree level preferred. The applicant must be prepared to travel overseas in any part of the world. A European language would be an asset.

Apply giving brief details in the first instance, with salary required, to:

> Sales Director DOULTON INDUSTRIAL PORCELAINS LIMITED Wilnecote, Tamworth, Staffs.

BRITISH STANDARDS INSTITUTION

Hemel Hempstead Centre

A N ELECTRICAL ENGINEER is required by the B.S.I. in connection with their testing station at Hemel Hempstead. The work is related to the examination of electrical equipment being exported and the approval of manufacturers applying for licences under the B.S.I. Certification Mark Schemes.

The duties will include visiting manufacturers' works to carry out engineering investigations and also the control of testing work at the Hemel Hempstead laboratories. All types of equipment, including domestic and industrial, is involved and the work is varied and interesting. interesting.

A student apprenticeship and/or testing experience at manufacturers' works or in laboratories is desirable, and the minimum academic qualification is Graduateship of the Institution of Electrical Engineers or its equivalent.

The starting salary will be commensurate with qualifications and experience. The post is reprisonable.

pensionable. Apply to the Establishment Officer, B.S.I., Park Street, London, W.1, quoting reference .H. (BL). H.H. (EL).

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

Appointment of Regional Personnel Officer (Vacancy No. MR.154)

A PPLICATIONS are invited for the post of REGIONAL PERSONNEL OFFICER in the Midlands Region of the Central Electricity Generating Board. The duties will include the interpretation and application of national agreements, negotiations with the trade unions, recruitment, selection and appointment of staff, development of a careers policy, welfare, canteens, etc.

The appointment will be made within the

Knowledge of the organisation of the electricity supply industry would be an advantage but is not essential.

Applications from suitably qualified persons, Applications from surably quantical persons, quoting the above vacancy number, should be addressed to the Regional Director, Midlands Region, 53, Wake Green Road, Moseley, Birmingham, 13, marked "Confidential," and should arrive not later than Monday, 1st May,

REPRESENTATIVES

(ELECTRIC HEATING)

K. COLE LTD., Heating Division, E. K. COLE LID., Iteating beautiful and the have outstanding opportunities for ambitious representatives with experience and retail connections in the following areas: London, Home Counties, North

Write in confidence with full details to:

Mr. J. E. Woodward E. K. COLE LTD. 5, Vigo Street, London, W.1

HERTFORDSHIRE COUNTY COUNCIL

Principal Engineer (J.N.C. "D," £1,710-£1,975 p.a.)

A PPLICATIONS are invited from qualified and experienced engineers to lead a reorganised and expanding section of engineers engaged on the design of heating and lighting installations and mechanical services in a wide variety of county buildings. Applicants should have experience in administration and the control of staff, but previous local government. trol of staff, but previous local government service is not essential.

This is a new post offering scope for a man of initiative who is prepared to accept delegated responsibility for the work of the section as

a whole.
Further particulars and form of application may be obtained from Geoffrey Fardell, M.B.E., A.R.I.B.A., County Architect, County Hall, Hertford, to whom they should be returned by

Monday, 1st May, 1961.

This post was first advertised in January, 1961, and candidates who have already applied will be reconsidered.

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

Third Assistant Engineer (Shift Control)

A PPLICATIONS are invited for the above post at Area Headquarters, Kilmarnock.

Applicants should have had previous experience of control room work involving an extensive distribution network up to 33 kV. Preference will be given to applicants holding a Higher National Certificate in Electrical Engi-

The salary for the post, which is superannuable, will be in accordance with the N.J.B. Agreement, Scale 9, Class K, Grade 10, £1,115/£1,245 per annum, plus 10% shift allowance.

Application forms, which may be obtained from G. F. Moore, Manager, Greenholm Street, Kilmarnock, should be received not later than 28th April, 1961.

PEEL PARK TECHNICAL COLLEGE, SALFORD

Principal: F. Wood, M.A.(Oxon), LL.B., A.I.B.

PPLICATIONS are invited for the following vacancies which will occur from 1st September, 1961:-

eptember, 1961:—
2 ASSISTANT LECTURERS GRADE B in ELECTRICAL ENGINEERING, for O.N.C. and Craft Courses. For one post preference will be given to candidates able to offer Radio Servicing and Electronics. Minimum qualification, H.N.C. in Electrical Engineering.
Solary in eccordance, with the Rupham

Salary in accordance with the Burnham Technical Scale, Assistant Lecturer Grade B, £700 to £1,150, plus additions for recognised training and degrees.

Further particulars and forms of application may be obtained from the Principal, Peel Park Technical College, Salford, 5, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

R. RIBBLESDALE THORNTON Clerk to the Governors.

BORD NA MONA

Vacancy for Electrical Engineer

A VACANCY exists at Dublin Headquarters for an ELECTRICAL ENGINEER with some industrial power experience.

Candidates should possess a University degree or equivalent qualification. Preference will be given to candidates who are not more than 35 years of age.

Entry point to the salary scale of £915/£35/£1,400 will depend on qualifications and previous experience.

Application forms are available from the Secretary, Bord na Mona, 28, Upper Pembroke Street, Dublin, 2. The latest date for receipt of completed application forms is 12 noon on 28th April, 1961.

DENBIGHSHIRE COUNTY COUNCIL

County Architect's Department, Wrexham

A PPLICATIONS are invited for the following post in the above Development A ing post in the above Department:—
ELECTRICAL ENGINEERING ASSISTANT, A.P.T. GRADE III (Salary £960/£1,140 p.a.).

Preference will be given to Graduate or Associate Members of the Institution of Electrical Engineers who possess good experience in the preparation of schemes, working drawings, specifications and estimates for modern electrical installations for all types of public buildings.

Contribution made towards removal expen-ses of successful applicant and consideration given to the payment of subsistence allowances to married officer.

to married other.

Application forms and further particulars obtainable from me. Completed forms to be returned by 29th April, 1961.

W. E. BUFTON,

Clerk to the County Council.

County Offices, Ruthin.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 2 Sub-Area

SSISTANT SECTION ENGINEER required in the St. Helens District. Salary within range £1,040/£1,165 per annum (N.J.B. H/9).

H/9).
Applicants should have received an engineering training and have experience in H.V. and M.V. overhead and underground distribution work. Technical qualification desirable.

Appointment subject to medical examination. Pension scheme.

Standard application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date, 20th April,

REDFORDSHIRE COUNTY COUNCIL

Electrical Engineer

A PPLICATIONS are invited from suitably qualified persons for the appointment of ELECTRICAL ENGINEER, A.P.T. Grade IV/V (£1,140-£1,480).

The successful applicant will be responsible to the Chief Heating Engineer for the preparation of schemes for electrical installations in new

County Buildings.

The commencing salary may be within the grades according to experience and quali-

Housing accommodation may be available in

certain circumstances.

Application forms obtainable from the County Architect, Shire Hall, Bedford, to be returned by 1st May, 1961.

DRAUGHTSMAN/DESIGNER

A FINE opportunity occurs for a draughtsman with experience of space heating schemes, preferably with some electrical knowledge, to join the Heating Technical Advisory Team that planned such famous installations as those in Waltham Abbey Church and many other fine buildings, as well as the world's greatest ocean-going liners. Excellent working conditions. Pension scheme,

Write in confidence to:-

Mr. G. R. Wibrow E. K. COLE LTD.

5, Vigo Street, London, W.1

CITY OF OXFORD EDUCATION COMMITTEE

College of Technology

Head of Electrical Engineering Department

A PPLICATIONS are invited for the new post of Head of the Department of Electrical Engineering (Grade II), to commence in September next.

Candidates should have had wide industrial

Candidates should have had wide industrial and teaching experience and should preferably hold a good Honours Degree in Electrical Engineering, although Corporate Members of the Institution of Electrical Engineers with experience of teaching to H.N.C. or H.N.D. level would receive consideration.

Further particulars and application forms (stamped addressed envelope), which should be returned by 1st May, may be obtained from the Principal, College of Technology, Headington Road, Oxford.

CONSULTING ENGINEERS REQUIRE INTERMEDIATE AND JUNIOR ELECTRICAL ENGINEER ASSISTANTS

to be capable of designing under limited super-vision all types of internal and external electrical installations in connection with hospital, educa-tion and industrial building programmes. These situations are for permanent staff and carry attractive salary coupled with pleasant working conditions, superannuation and life assurance scheme.

E. G. PHILLIPS SON & PARTNERS 26, Annesley Grove, Nottingham

ESSEX EDUCATION COMMITTEE

South-West Essex Technical College and School of Art, Forest Road, Walthamstow, London, E.17

A PPLICATIONS are invited for the post of ELECTRONICS TECHNICIAN in the Engineering Department of South-West Essex Technical College. Applicants must have both R.T.E.B. certificates or H.N.C. in electronic subjects. Salary £760-£825 per annum, plus London weighting.

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

A PPLICATIONS are invited for the position of INSTRUMENT ENGINEER at Ironbridge Power Station, Buildwas, Salop. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.10, £1,040-£1,165 per annum.

Applicants must have had experience in the operation and maintenance of all types of power station instruments (excluding electrical instruments), and should preferably hold the Higher National Certificate in Mechanical Engineering or equivalent qualifications.

Apply, quoting Vacancy No. 93/61MD, on

Apply, quoting Vacancy No. 93/61MD, on form AE6, available from the Station Superintendent, Ironbridge Power Station, Buildwas, Salop, by 24th April, 1961.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

SENIOR DEMONSTRATOR required in the D Liverpool South District, Salary within range £700/£775 per annum (N.J.C. Grade 2).

range £700/£775 per annum (N.J.C. Grade 2).
Candidates should have previous experience as a demonstrator, with a good knowledge of electrical household appliances, and be competent to supervise demonstrations on cooking, laundering and housecraft subjects, Possession of a recognied Diploma in Domestic Science or other approved qualification is desirable.

Excellent annual holiday and sick pay schemes. Appointment subject to medical

schemes. Appointment subject to medical examination.

examination.

Standard application forms, obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 28th April, 1961.

653

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

MECHANICAL MAINTENANCE
ENGINEER, PORTSMOUTH
GENERATING STATION
(SEC/3.142).

Applicants should have had considerable experience in the maintenance of generating station mechanical plant, and must be capable of controlling staff and planning and supervising mechanical plant maintenance.

Candidates should be corporate members of an appropriate professional institution or hold qualifications leading to such membership.

Salary N.J.B. Grade H.7, Scale 10, £1,190-£1,325 per annum.

Special application forms (not A.E.6/ACT), obtainable only from Divisional Secretary, 111, High Street, Portsmouth, should be returned by 18th April, 1961.

EXPERIENCED PERSONNEL.

EXPERIENCED PERSONNEL

required to fill new posts in expanding Company manufacturing electrical and electro-mechanical products.

CHIEF DRAUGHTSMAN, PROJECT ENGINEER and SENIOR TEST ENGINEER, all of H.N.C. Standard, DETAIL DRAUGHTSMAN of O.N.C. Standard and also MODEL MAKER required.

Applicants, who must have at least five years' workshop experience in addition to theoretical education, should apply in writing in the first instance stating age, experience, present salary and salary required, etc., to the Technical Engineering Dept., CRATER PRODUCTS LTD., Lower Guildford Road, Knaphill, Woking, Surrey Woking, Surrey.

ASSISTANT ELECTRICAL ENGINEER (Age 23 - 28)

A N opportunity with S.W. London contractor in an increasingly important section of industry. To assist Quantity Surveyor of installations, to measure, take off quantities, prepare rates and accounts.

Previous experience necessary in practical Applications should be sent to the Clerk to the Governors at the College, Forest Road, Walthamstow, London, E.17, before 1st May.

Solutions experience necessary in practical work, estimating, drawing office or costing office. Salary determined by knowledge of the trade. Pension, 5-day week and 3 weeks' vacation.—

Box 585.

DESIGNER-DRAUGHTSMAN

DESIGNER-DRAUGHTSMAN required North-West London area. Knowledge in electrical wiring accessories an advantage. Good opportunity for right man. Apply stating age, experience and references.—Box 607.

SENIOR ELECTRICAL DESIGNER

FULLY experienced in motor control gear OLLLY experienced in motor control gear and medium-voltage distribution switchgear. Qualifications: Degree, H.N.C. or Corporate Member of I.E.E. The position offered is highly responsible and there exist first-class opportunities for promotion.

Apply in writing to the Secretary, Wallacetown Engineering Company Limited, Ayr, Scotland. All applications in strictest confidence.

LECTURER IN ELECTROTECHNOLOGY

required 1st September, 1961, for work with Higher National Diploma, Higher and Ordinary National Certificate and C.G.L.I. courses. Candidates should hold graduate or equivalent professional qualifications and have appropriate industrial experience.

industrial experience. Some teaching experience desirable. Salary scale £1,370 to £1,550.

Application forms and further particulars from the Principal, Cambridgeshire Technical College and School of Art, Collier Road, Cambridge.

OVERHEAD TRANSMISSION LINE ENGINEERS

ARGE contracting organisation has vacancies in Scotland for Site Agent and Engineers of proved ability with experience of steel tower and wood pole overhead line construction.

Age and full details of experience to—Box 662, Keith & Co., 137, Princes Street, Edinburgh.

FOREMAN ARMATURE WINDER

required by leading London electrical repairs organisation.—Box 661.

PPLICATIONS for the position of a senior A PPLICATIONS for the position of a representative are invited from experienced men holding the necessary educational and technique to the property of the property of the property of the property of the position of the pos men holding the necessary educational and technical certificates by a firm manufacturing diesengines and ancillary equipment including generators, pumps, etc. Full details of age, experience, etc., to—Box 628.

A RMATURE and stator winders, skilled, required for repair work. Apply—W. T. Poole Engineering Ltd., Barnett Wood Lane, Leatherhead, Surrey (L'head 2122).

A SSISTANT engineer required for wood pole line contracts in Scotland.—Ref. J.H.P., B. French Limited, Kidderminster.

590

B. French Limited, Kidderminster.

900

DUYER to take complete charge of purchasing department in rapidly expanding organization dealing with companies engaged in electronics. Knowledge of electro-magnetic relays an asset. Must be capable of working entirely on own initiative and commanding minimum commencing salary of £1,000 p.a. Pension scheme available. Apply in own handwriting to—Box 634.

CABLE engineer experienced in the manufacture and design of impregnated, paperinsulated, solid type power cables of all voltages required as liaison engineer. Duties will involve the technical aspects of standardisation, rationalisation procedures and quality control. Please write with full details of experience, qualifications, etc., to the Staff Officer, ref. 736/55, Associated Electrical Industries Ltd., London, S.E.18.

CABLE estimator required. State age and

NABLE estimator required. State age and experience.—Wandleside Cable Works Ltd., 6, Garratt Lane, Wandsworth, London, 106, C S.W.18.

CONSULTING engineers require inter-

mediate design-draughtsman for electrical services. Excellent promotion prospects in expanding practice. Write—Locke & Beal, 303/307 Balham High Road, London, S.W.17. 608

BESIGNER required for L.T. switch and fuse gear. Apply by letter giving details of experience and salary required to—Wm. Sanders & Co. (Wednesbury) Ltd., Ridding Lane, Wednesbury, Staffs. 586

YURRENT transformer designer required by Crompton Parkinson Ltd. Consideration would be given to applicant without previous experience, but essential reached H.N.C. standard or equivalent. Write with full particulars to — Personnel Officer, Clayton Road, Hayes, Middlesex.

Middlesex,

PRAUGHTSMAN required. Experience of wiring diagrams for medium/low voltage switchboards and motor control circuits. Existing holiday arrangements honoured. Super-

switchboards and motor control circuits. Existing holiday arrangements honoured. Superannuation scheme in operation. Apply—Chief Draughtsman, Varilectric Limited, 10, Melon Road, Peckham, London, S.E.15. 8173

LECTRIC lamp manufacturers require a foreman for low voltage lamp production at their Yorkshire factory. Must be fully experienced in modern methods of manufacture for both butt-seal and headlamp types. Apply in writing stating age, experience and salary required to—Box 664.

ELECTRICAL contractors, London, S.W.16 area, require first-class estimator, supervisor, etc., preferably with contacts. Full details of age, experience, salary required to-Box

LECTRICAL engineer required to be responsible to Society's architect and works manager for the whole of Society's electrical installations, maintenance of existing services and new developments. Present staff comprises 38 journeymen electricians and apprentices. Applications stating salary required, present position and qualifications should be addressed to the Personnel Officer, Birmingham Co-operative Society Ltd., Castle Street (off High St.), Birmingham, 4. Birmingham, 4.

NFIELD-STANDARD POWER CABLES Property of the Contracts of the Contract of the Contract

E STABLISHED progressive electric heating appliance manufacturer requires first-class senior sales representative to call on electrical wholesalers in the London area. Man of considerable experience and connection required for this highly remunerative position. Car provided. Write full details in confidence to—Box 609.

ESTIMATING/supervising and/or design and also junior engineer required for progressive positions for high-class installation work in an expanding company. Write in conwork in an expanding company. Write in confidence stating age, experience and salary required to—Alliance Electrical, 2, Henrietta St., London, W.C.2. Progressive salary with possibility of a non-contributory pension and free life assurance.

EXPERIENCED estimator required familiar the with medium/low voltage switchgear, starter panels, etc. Existing holiday arrangements honoured. Superannuation scheme in operation. Apply — Varilectric Limited, 10, Melon Road, Peckham, London, S.E.15. 8174

CENERAL foreman required for wood pole line contracts in Scotland.—Ref. J.H.P., B. French Limited, Kidderminster.

INSTRUMENT maker with experience I mounting and calibrating sub-standard indi-cating instruments for standards section of laboratory. Staff appointment offered to suitable applicant. Permanent pensionable position with prospects of advancement. Please apply—Personnel Manager, Landis & Gyr Ltd., Victoria Road, North Acton, London, W.3. 671

OPPORTUNITY for keen man about 30 to take charge of sales office of old-established London firm in lighting industry. Experience in lighting fittings. Sales activities desirable but not essential. Applicants must have good knowledge of the electrical trade and be accustomed to dealing with users, contractors, architects, etc. Good prospects for keen organiser, 5-day week, pension fund. Write fully to Box 509, stating age, experience and salary range.

PLUMBER cable jointers required for contracts in Southern England. London rates and overtime.—Box 7708.

SALES representative required in connection with high class specialised rotating elecwith high class specialised rotating electrical machines. Reply, stating age, experience, qualifications, etc., to the Managing Director, W. Mackie & Co. Ltd., 129/133, Lambeth Road, London, S.E.I. 665

SENIOR electrical contracting engineer able to deal contracts to final accounts required South Wales area. Excellent prospects suitable man. Write age, salary, experience.—Box 8206.

SENIOR and junior electrical design engineers' office. 5-day week, luncheon vouchers, Spring and Summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.I.

HOPFITTING. A vacancy will shortly exist in the busy shopfitting section of the Society's Works Department for an outside supervisor for shopfitting work. There will also be a vacancy for a person to assist the production supervisor on shopfitting production. Applicants should be skilled carpenters and joiners, preferably with shopfitting experience. There are good conditions of service and the positions offer considerable scope for the right men. Applications stating qualifications, etc., should be addressed to the Personnel Officer, Birmingham Co-operative Society Ltd., Castle Street (off High St.), Birmingham, 4.

SOUTH WALES SWITCHGEAR Limited have vacancy for engineer required in the design of large power transformers. This SENIOR and junior electrical design engi-

have vacancy for engineer required in the design of large power transformers. This position offers excellent opportunity for young man seeking promotion with a growing organisation. Apply in writing giving full particulars of experience, etc., to the Managing Director, South Wales Switchgear Limited, Blackwood, Mon

SUPERVISING electrical engineer for electrical contractors' London office able to prepare schemes and estimates and carry through to account stage. Progressive, pensionable situation. Write—W. J. Furse & Co. (London) Ltd., 22, Alie Street, Aldgate, London, E.I.

Ltd., 22, Alie Street, Aldgate, London, E.I.

OUPERVISING engineer, experienced, required by expanding firm of electrical contractors N.W. London. Progressive position. Pension scheme. Write stating age and experience to—Box 196.

OURVEYOR required for wood pole line contracts in Scotland.—Ref. J.H.P., B. French Limited, Kidderminster.

TECHNICAL manager required for West London electrical equipment manufacturing company. Experienced knowledge of circuit breakers and control gear required, with awareness of the requirements of flameproof equipment. Applications are invited from qualified electrical engineers for this senior appointment, with age not exceeding 45 years. The appointment is pensionable and applicants are requested to submit full details of technical qualifications, experience and training, etc., to — Managing Director, c/o Box 532.

Director, c/o Box 532.

TEST engineer required by well-established company in the South of England for their current and power transformer test depts. Applicants should have O.N.C. or similar qualifications. Write with particulars of education, experience and salary required to—Box 571.

TRANSFORMER development engineer to be responsible for impulse testing and other interesting development work in an expanding organisation. Good salary and prospects for suitable applicant. Reply in confidence, stating age, experience and qualifications.—Box 627.

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Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

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SENIOR ELECTRICAL ENGINEER

wishes change. Can introduce new business. Design, estimate, supervise, etc., from enquiry to accounts. Reply-Box 7703.

RINGINEER electrical, age 35, who is not afraid of work, returns U.K. May-June and seeks progressive remunerative appointment, home or overseas. Experienced in most aspects of a supply company as well as contracting and maintenance.—Box 337.

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OMPLETELY mobile bachelor, London, of OMPLETELY mobile bachelor, London, of good education and appearance with seven years' auditing and accountancy and twenty-two years' electrical experience (4 installations, 2 site cable supervision, 3 outside expediting, balance—all aspects material control) seeks travelling post in equipment expediting, auditing and/or control, liaison duties or equivalent. Good salary and conditions. Please write—Box 7714a.

EXPERIENCED estimator/supervisor seeks position with electrical contractors operating from N.W. Kent area. Car owner.—Box 7713.

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 $200^{ ext{-240-v. A.C. or D.C., 10}}$ amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr

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A.A. ELECTRICAL Co. for A.C. - D.C. A.A. ELECTRICAL Co. for A.C. - D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W4. 57
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A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

A.C. and D.C. slotmeters and quarterlies. Reconditioned, guaranteed 2 years. Repairs and recalibrations.—Victor Electric Co., South View, Sweet Hill, Patcham, Brighton, Sussex. London agents, phone Downland 4682 (Surrey).

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A LTERNATORS, 3-phase, all sizes in stock
A from 7 kVA up to 330 kVA.—Britannia
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CABLE, underground, PILC/VIR/LC, ex
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316
CIRCUIT-breakers, various sizes in stock,
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CONDENSERS, 250 mfd., 240 v. A.C., for
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CRANE motors. Direct current, series wound
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22
Diesel generating sets, all sizes to 500 kW.
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FOR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1).

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MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514).

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NAMEPLATES, engraving, diesinking, sten-cils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry.

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ONE B.T.H. synchronous induction motor, 350 h.p., 3-phase, 50 cycles, 5,750 volts, complete with control cabinets with power factor correction and exciter. Price £895, F.O.L. Tottington.—Hodson & Co. (Machinery) Ltd., Tottington, near Bury, Lancashire.

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15

DOLYPHASE kilowatt hour meters. Available

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1.

PREPAYMENT 1s. slot house service meters.

-Universal Electrical, 217-221, City Road, London, E.C.1.

London, E.C.1.

DURLEY chokes and ballasts. Our 80-w.
tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most
popular unit. Suitable for most fittings, 57s. 6d.
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Purley, Surrey (Uplands 4818/9).

UARTERLY credit meters, single and polyphase, 2½-100 amps. From 20/-. Also
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D.C. See Television.—Tradex, Surbion. 1/1

POTARY converters in stock, all sizes;
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221, City Road, London, E.C.I. 34

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SOAG paper drilling machine in excellent condition. Cost new approximately £240; will sell for £150. Please telephone Mr. P. C. Davie, WATerloo 3484.

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ENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire, 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401).

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D.C./A.C. Motors, Transformers, Cables and all redundant Power Station plant wanted for dismantling.

ASK US TO QUOTE

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A.C./D.C. electric motors, generators, transformers, disused stocks of cable, power houses bought and dismantled.—Samuel Hyams, Lams Lane, Rainham, Essex (Rainham

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk,

Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1.

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WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

150-h.p. variable speed motor wanted, with speed range of either 1,800/450 r.p.m. or 1,450/360 r.p.m. 415 volts, 3-ph., 50 cycles, complete with control equipment.—Vinatex Ltd., Devonshire Road, Carshalton, Surrey. 668

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is interested in the acquisition of an is interested in the acquisition of an organisation actively manufacturing small A.C. and D.C. Motors (not fractional horsepower sizes) which is capable of expansion. Favourable consideration would be given to the retention of existing staff and management.

Replies, which will be treated with strict confidence, should include fullest details of present products, location and capacity for expansion, and be addressed to—Box 572.

ELECTRICAL contracting business for sale in East Midlands. Offers invited for stocks, goodwill and certain fixed assets.—Box 7707.

WORK WANTED AND OFFERED

.C. and D.C. motor rewinds and repairs. A Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

LECTRICIAN (semi-retired) with own workshop facilities seeks assembly or appropriate work.—BARnet 2289. 592

VAILABLE capacity for winding fractional A VAILABLE capacity for winding fractional to 200-h.p. motors. Also machining and assembly of electrical components. Leading manufacturers please note. Skilled operatives, small overheads enable keen prices, by contract or otherwise. Rewinds and repairs.—S. W. Fletcher (Electric Motors) Ltd., 33, Elenora Street, Stoke-on-Trent (Tel. 44551).

A LUORESCENT fittings, shells and chokes to BS 2818 (Licence No. 3237), coil winding, all sheet metal work.—D. E. Cowling & Sons Ltd., Romside Trading Estate, North St., Romford 47282.

Romford 47282.

NSPECTION and specification for elec. work;
free-lance.—Beaumont, 334-6, King Street,

Prompt and reliable deliveries.—Lewis Electric Motors Ltd., Moor Wks., Maidenhead, Berks. 194

AGENCIES .

AGENCIES.

A GENT with good connection electrical and hardware wholesalers in Lancashire and Cheshire seeks further lines.—Box 7716.

A GENTS required for Scotland and North of England to represent transformer and specialised electrical equipment manufacturer, located in Scotland.—Box 670.

WINDAK Ltd., Woodside, Poynton, Ches., are seeking the services of a first-class agent to promote the sale of their well-known Windak low-voltage safety electric blanket in the Home and South-East Counties. Applicants should have a sound connection with retail sales, better-class stores, electricity boards, etc., and should not carry any competing line. Apply by writing in the first instance.

PARTNERSHIPS

A S from 5th April, 1961, the Architectural and Town Planning practice of Grenfell Baines & Hargreaves, and the Quantity Surveying practice of Arnold E. Towler, will merge into one professional organisation to be known as DESIGN PARTNERSHIP.

Founder Partners of the new firm will be:

George Grenfell Baines, O.B.E., F.R.I.B.A., Dip.T.P., M.T.P.I. John Wilkinson, Dip.Arch.(Manc.), A.R.I.B.A.

Arnold E. Towler, F.R.I.C.S. William White, A.A.Dip.Hons., A.R.I.B.A.

Mr. Thomas Hargreaves is retiring from the practice.

It is intended that the Partnership in the future should cover all the professions connected with the design of buildings and physical environment generally.

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OITY and Guilds (Electrical, etc.) on "No pass—No fee" terms. Over 95% successes. For details of modern courses in all branches of electrical engineering, applied electronics, automation, etc., send for our 148-page handbook—free and post free.—B.I.E.T. (Dept. 12a), 29, Wright's Lane, London, W.8.

COMPANY MEETINGS

ERICSSON TELEPHONES

Satisfactory Trading Result

THE Fifty-eighth Annual General Meeting of Ericsson Telephones Limited was held on 4th April in London.

on 4th April in London.

Sir Harold A. Wernher, Bt., G.C.V.O., T.D., the Chairman, in the course of his speech, said: The trading result for the past year was satisfactory and showed a very welcome recovery from the recession of the previous year. Our profits in 1959 were considerably affected by several exceptional factors. A more equable atmosphere prevailed in 1960 and we were able to take advantage of this with the result that invoiced sales considerably exceeded those of the previous year.

Faculty gratifying is the knowledge that our

Equally gratifying is the knowledge that our order book is substantial and ensures a high rate of productivity throughout the current

Exports continue to represent a substantial part of our trading, and while in monetary value the percentage of exports to total sales showed a slight drop on the previous year, it actually represented an increase of over 18%.

Almost everywhere there is always a steady and dependable demand for telephone service. There are 135 million telephones in use throughout the world, and one authority has forecast that by 1980 this should increase to 500 millions. If this is a fair estimate there will be plenty of work in the future for your company.

We have a trading profit for the year of £1,086,650; this is a big advance on the 1959 profit of £653,160.

I feel fully justified in ending on a note of confidence. Our order book is in very good shape and our factories well conditioned to give us a good output in 1961. To cope with the heavier load we are increasing the capacity of the Beeston and Sunderland factories.

The report was seconded by Mr. J. H. Reed, C.B.E., Managing Director, and a final dividend of 9% free of tax on the Ordinary Stock as increased by the share issue in November last, making a total of 13%, tax free, was approved.



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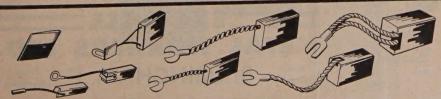
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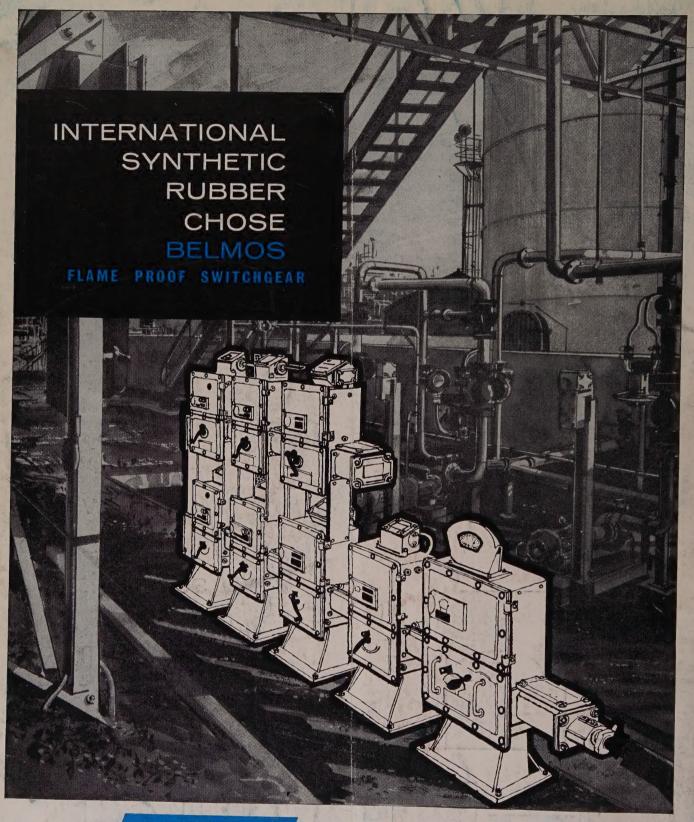
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